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The Farmer's Digest

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The Farmer's Digest

Volume 4 November, 1940 Number 7

Invigorating Bulls

Condensed from Guernsey Breeders Journal

Dr. T. S. Sutton
Ohio University

A method of treating sterile bulls which holds considerable promise has recently been discovered. In the examination of sterile bulls and bulls with irregular and doubtful breeding histories, it was found that the amount of Vitamin C in the blood was usually lower than that normally found in bulls with good breeding histories. These findings led to the treatment of sterile bulls with Vitamin C. The results have been extremely encouraging. The records obtained in Wisconsin and Ohio have shown that about seventy to seventy-five per cent of the bulls treated have shown definite improvement and in many cases the results have been dramatic. Both young and old bulls have responded to this treatment, although as would be expected the chances of recovery are not as good in aged bulls.

In carrying out this treatment, Vitamin C is injected subcutaneously at the rate of about one gram per 1,000 pounds body weight at intervals of three or four days. For injection, the crystalline vitamin is dissolved in sterile salt solution (one part of salt in 110 parts water). This solution should be made up fresh just before injection. If allowed to stand in solution the vitamin C quickly loses its potency. Injection is made subcutaneously (just beneath the skin) in the neck or shoulder region.

The treatment should be extended over a period of from four to six weeks. Bulls that have been slow or unwilling to serve will usually show improvement in seminal activity before the end of this time; however, the return of the semen to normal is usually preceded by a noticeable improvement in sexual activity.

Vitamin C can be purchased in pure crystalline form from many of the larger drug firms. When purchased in ounce quantities it should not cost more than fifteen cents per gram. Enough Vitamin C should be purchased for $1.80 to treat a 1,500 pound bull.

Reprinted by permission from the Guernsey Breeders Journal, Peterborough, N. H., September 15, 1940

Grass Silage Steps Ahead

Condensed from Certified Milk

J. W. Bartlett, Ph.D.

Professor of Dairy Husbandry, New Jersey Agricultural Experiment Station

THE program of preserving grass crops as silage has gained a greater momentum among the dairy farmers of this country than perhaps any other recent project in dairy farming. While the preservation of grass as silage has been practiced in the old country for a great many years and was studied in Kansas Agricultural College some twenty-five years ago, it was not until recently that farmers, silo producers, engineers and farm machinery manufacturers, have all become enthusiastic on the same subject. It usually takes from ten to twelve years after we have proven through research that a certain idea is of benefit to the farmer until it is generally adopted by the farmer. This grass silage program has reached a momentum that is running ahead of research. The problem in the dairy research field today is one of keeping ahead of the farm practice.

The New Jersey Experiment Station does not claim any priority rights to the promotion of the grassland farming program. Through necessity it did adopt a grass silage, better haylands and improved pasture combination about seven years ago.

Five problems seem to stand out as one reviews the field. They are:

1. The relation of moisture in grass to its successful preservation as a silage.
2. Economical methods of harvesting and silo filling.
3. The correct preservative and its application.
4. The roughages to put in the silo.
5. How much grass in the form of silage or hay shall we preserve for our livestock?

Moisture creates an engineering problem for the agricultural engineer and the silo manufacturer. Experience at our station leads us to recommend that the farmer who puts up grass with a moisture content between 70 and 80 per cent will most generally be successful in securing a good product, providing he has applied enough preservative. It would take too much time here to discuss all of the details involved i

Reprinted by permission from Certified Milk, New York City, September, 1940

this moisture question. However, we must learn more through study about pressures within the silo, temperatures, and materials to be used in silo construction that will stand up over a period of years against the ravages of the silo juice.

This question of seepage is one which has not been answered. We have to ask ourselves, "Shall we build tight silos?" "Shall we allow the seepage to run away through drains?" or "Need we worry at all about the juice which runs away from the silo that has been filled with grass of high moisture content?" Moisture is directly related to the tonnage of dry matter that may be ensiled. We have a silo which will hold 60 tons of dehydrated hay, 250 tons of corn silage, 185 tons of mature grass and this year the same silo filled with grass containing 80 per cent moisture finally held 330 tons. More dry matter went in that silo this year than any other time.

One thing must be kept in mind and that is that if this grass silage program is to be adopted generally, its preservation must be simple and practical. The method must be one that can be used by the average farmer with a minimum of farm machinery. We have, therefore, in our advice to farmers, tried to be safe in our suggestions and have advised him to get his grass from the fields just as soon as possible after cutting.

Proper equipment is indeed one of the most pressing problems at present. The handling of green grass is in any event a hard job. To handle it quickly, easily and economically requires simple equipment and yet equipment strong enough to stand the "gaff." It would appear that a five-foot swath will serve best in order that it will allow the use of a hay-loader to pick up the green material directly without the use of a rake. On level to rolling country, a windrower attachment has proved quite satisfactory. On hillsides, however, the windrower will not do a good job and grass will be left in bunches or will clog the mowing machine. Hauling of small loads with few men seems to be better than trying to haul large loads of two or three tons of grass with a large crew.

As to the preservative, considerable research is now being conducted with several materials. The New Jersey Station has given more attention to the use of molasses than any other. At the present time both molasses and phosphoric acid are being used at our Station for this purpose. Our hope in the use of molasses is that there may be considerable feeding value left for the nutrition of the dairy cow at the same time that the molasses has served as a preservative. We have this

year used up to 300 pounds of molasses per ton and will, during the winter feeding season, determine the value of such quantities in the dairy ration with milking animals and growing heifers.

Molasses has been introduced into the silage cutter both by gravity and by pump. We have also used a force pump to elevate the molasses to the top of the silo where it has been released into the distributor pipe. Pumps make an additional cost, require more attention and again, add to the bother for the average farmer. More research on preservatives and their method of application is very seriously needed.

The question of green materials to put in the silo is one which need not concern us very much. These crops which will grow best in a local community will result in the most economical silage. A year or two ago we would not have believed that corn would be threatened in this program by grass, legume or cereal crops. However, if we consider the average yield of corn in our state, statistics reveal that ten tons per acre is an average for the state and yet many farmers boast that they grow 20 tons per acre. Comparing this yield in terms of protein and total digestible nutrient content on an acre of corn with cereal grass and legume crops, our census reports would show that corn leads.

If we will consult the charts, we notice that in tons per acre on a green weight basis, corn, alfalfa, sweet clover, sudan grass, and soybeans and sudan grass, yield somewhere between 8 and 10 tons of green weight per acre. On the basis of graphs which deal with the protein and total digestible nutrient content of 100 pounds of the various crops that may be used for ensilage, we note that the protein content of alfalfa is approximately twice that of corn. We also note that clover, soybeans and even pasture will exceed corn in protein yield. On the other hand when we consider the total digestible nutrient content per acre of each of the crops, corn leads with quite a perceptible margin. The truth of this matter, however, is that the average farmer fertilizes his corn with stable manure and usually adds from $3 to $8 per acre in commercial fertilizers.

We have a graphic story of what happened on several New Jersey farms during the past year where the same amount of money was applied to the fertilization of alfalfa, pasture and other crops as is usually applied to the corn crop. We have actual photographs of fields from which 25 tons of green alfalfa were removed during the past season in three cuttings, and other fields from which as high as 26 tons of Ladino clover were harvested

per acre in three cuttings. At the Walker Gordon Farms at Plainsboro, N. J., a crop of wheat and vetch yielded in green weight per acre during the month of May, approximately 11 tons per acre. Immediately following the harvesting of this crop, soybeans were drilled as a second crop for the season. The yield in September was approximately 10 tons of green weight per acre. Thus it offered the possibility of growing annual crops high in protein that will yield over 20 tons to the acre. In our program of grass farming, oats and peas or other cereal crops are being used as a nurse crop in order to get our grassland from sod back into sod in one year without cropping it with corn.

This past year we have made grass silage from mixed grass pasture which yielded 9 tons of green weight per acre on first cutting. This pasture was then used for grazing during the remainder of the season. When alfalfa or other legume crops and even grasses will yield a total of 1,800 pounds of crude protein per acre and 5,000 pounds of total digestible nutrients per acre, it does not seem that we shall be able to prevent a revolution in our roughage program.

A number of farmers, both in central New Jersey and in Northern New Jersey, one section being level and the other hilly, have transferred their farming program to one of a complete grass and legume schedule. I have been advised that farmers even in the state of Wisconsin are abandoning a corn program in order to avoid plowing and to reduce labor costs. Many dairymen in the East are filling their silos twice, feeding grass silage during the usual drouth of July and August. In addition, we must admit that a grass program prevents soil erosion, one of the problems which very definitely faces the dairyman.

The fifth problem which was mentioned was that of the amount of silage to be consumed safely by our livestock, or the amount for which we shall need to provide storage. Research work at the New Jersey Station during the past two years has shown that growing heifers may be developed to normal size on a pasture, hay and grass silage diet from the time they are 12 to 15 months of age. Our records show, however, that we get from 10 to 15 per cent better growth where from 4 to 6 pounds of hay are used daily in addition to about 36 pounds of grass silage during the winter months. In comparing grass silage and hay with corn silage and hay, corn silage and grass silage, and grass silage alone, grass silage and some dry hay produced slightly more milk during a three months' reversal

feeding trial, than did any of the other combinations of roughages. The condition of the milking herd was also noted during the various feeding trials. With grass silage and approximately 6 pounds of hay per day, cows gained in weight, while in all other feeding trials there was a slight loss in weight. Grass silage and hay maintained high color in the milk with a very fine flavor.

We have received a great many inquiries as to the possibility of barn construction using the one-story barn with silos for storage of roughage. It would appear to date, however, that we cannot safely recommend the use of grass silage as the entire roughage diet for the milking cow or the growing heifer if we are to get maximum results. There is, therefore then, the problem still of constructing some sort of storage for dry hay.

The problems which have been presented in this discussion definitely show that there is still need for a great amount of research before we shall know the full answer to the question of preserving green crops in the silo. We have yet a program of several years before many of the questions may be answered. Grass programs are here to stay and there are a great many problems for the engineer and for the silo manufacturer. I would, however, again repeat that we must think of the preservation of green crops in terms of the average dairy farmer. Costs must be kept low, simple equipment must be adopted in order that Mr. Average Dairy Farmer can harvest his crops to have a good feed for his dairy herd.

Squab Production

Condensed from Rural New-Yorker

SOME interesting facts relative to the production of squabs for market use have been uncovered in the records kept during the past few years at the New Jersey State Pigeon Breeding Contest located at Millville, N. J. In this project pigeon breeders enter one or more pens of mated pigeons with six pairs in a pen, and since it started in 1931 more than 1,000 pairs of pigeons have been kept for a record of their egg production, fertility and hatchability of their eggs, livability of their squabs and the weight of the squabs when marketed. In all, ten breeds have been tested, including White King, Silver King, Giant Homer, Carneaux, Mondaine, Homer-Dragoon, Runt, Maltese, Black Hungarian and mixed crosses.

One of the most interesting points discovered has been the amount of feed required to produce a pound of squab meat, this varying from 7.5 pounds in the Carneaux breed to 20.8 pounds in the Runts. The average for all breeds has been 8.6 pounds, a figure almost identical with the feed required to produce one dozen eggs in fowls. The establishment of this basic fact immediately places the whole squab industry on more or less of a luxury basis in comparison with the market egg industry, as the food value of a dozen eggs is considerably in excess of the food value of one pound of squab. Nevertheless, the market return per pound of squab has generally approximated the market value of a dozen eggs for the past few years, which leaves the net return per unit of product about the same in the production of squabs as in the production of eggs. To carry this idea along further, the question arises as to the annual yield of squabs in comparison with eggs, per unit of producing animals, namely a pair of pigeons or one chicken. In this respect there is very little difference, the average annual production per pair of pigeons being 13.4 pounds of squabs, as compared with an annual record of 13.5 dozen eggs per bird in the New Jersey Egg Laying Contests, counting both pullets and hens. So while the fundamental fact may be that squabs are more or less of a luxury food, still there appears to be a market for at least a limited number at a price which does allow for some profit.

A second phase of the problem of squab production is the great

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difference that exists in the ability of pairs to produce a large number of squabs. Among the breeds tested the Carneaux gave the best results with an average of 12.7 squabs per pair of breeders in one year. The poorest results were secured with the Runt breed, their production being 4.9 squabs per year. In every breed there was a wide difference in the production of the individual pairs, ranging from one or two squabs annually from the poorest pairs up to 20 or 22 squabs annually from the best pairs. This variation gives promise of permitting considerable improvement in the production of squabs and the possibilities of breeding pigeons for increased squab production may be as great as the breeding of chickens for egg production. Towards this end, the practice at the Breeding Contest is to pedigree squabs from the best pairs of pigeons, encouraging the flock owner to purchase these back for breed improvement at home. The gross income from a pair of good producing pigeons will approximate $6 a year, as compared with $3.50 for an average pair, which gives some indication of the possibilities from a flock of really good breeders.

The feeding of the birds at the contest has been a simple matter, the following grain mixture being used: 400 pounds whole yellow corn, 200 pounds Kafir corn, 150 pounds hard red wheat, 150 pounds Canada peas, and 25 pounds each of hemp seed, millet, hulled oats and buckwheat. The grain is fed twice daily, giving the birds all they want at each feeding. Grit is supplied constantly, and the birds always have water available. Tobacco stems are used for nesting material, with gravel on the floor for litter.

Fertility has averaged 85.5 percent over a five year period, with hatchability of fertile eggs 94.8 percent, and livability of squabs 91.7 percent. Livability in the adult stock also has been very good, only 2.9 percent of the pairs being broken by the death of either one or both mates. The average dressed weight of squabs has been 16.3 ounces, the Runt breed producing the heaviest, 20.3 ounces each, and the Homer-Dragoon cross the lightest at 11.9 ounces per squab. Here again the factor of breeding may be important as some pairs within any one breed produce much heavier squabs than others.

Considering all factors, the squab business offers as many interesting possibilities as the poultry business. The sale of breeding stock from known good sources should be one of the new lines that people with vision and a desire for work should be able to develop.

Weeping Barns

Condensed from The Ohio Farmer

G. R. Shier

HE never had trouble with his old barn—the one the fire burned down last year—but something would have to be done about the new one. He had tried to build it right. The windows and doors were closely fitted, the roof didn't leak and the siding was laid so tightly that it swelled up and buckled in a few places. Then, to top it off, he gave the new barn a prime coat of aluminum paint and finished it with white house paint. There it stood out north of the house gleaming white in the summer sun, a fine looking barn, indeed, but despite its look it wasn't right. Something had to be done before cold weather.

Inside, high up under the rafters we could see the trouble. Standing on the lower floor and looking up the hay chute, anyone could see that something was wrong. The rafters and sheathing boards were darkened as if they were rotten.

We were in a weeping barn, and if it had been winter instead of summer, we could have watched it weep. There would have been frost on the underside of the roof and later the frost would have melted and dripped on the hay below.

Thousands of Ohio barns weep all winter long. The weeping often causes serious damage to both barn and hay, yet the remedy is fairly simple.

The weeping is usually found in tight barns containing a considerable amount of livestock. The moist, warm air from the animal quarters rises up through open chutes, stairs, or barn floors until it comes in contact with the cold underside of the roof. There it condenses or sweats on the cold surface and starts to drip. As far as a dripping roof is concerned, the answer is fairly simple. Close up all openings between the animal quarters and the mows. This prevents the moist air from coming in contact with the cold rafters under the roof.

Will roof ventilators help? Perhaps a little, but the chances are that when the openings between the animals and the hay mows are closed, weeping will stop.

The moisture is still in the barn, but confined to the lower floor and that's where the man's next problem comes in. He already had trap doors for the stairway and the hay chutes. It didn't sweat under the roof any more, but the sidewalls down below were terrible until he took to

Reprinted by permission from the Ohio Farmer, Cleveland, Ohio

leaving the windows open, then the sweating stopped. But what was the use of building a tight, warm barn if you had to keep the windows open night and day? He might just as well have used plain boards on the sides and let the wind blow through the cracks.

Cases like these are typical of what happens when someone makes an effort to stop the air leakage that normally goes thru the sides of many of our Ohio livestock barns. The damp air is held inside the barn. If it can reach the roof, it sweats on the underside of the roof; if it can't reach the upper part of the barn, it may sweat in the lower part of the barn. The siding often buckles and the paint peels off.

The principle to be followed in preventing condensation on the inner wall surfaces and under the roof is fairly simple. Prevent warm, moist air from coming in contact with cold walls and ceilings. Adequate insulation of the walls and a ventilating system that will remove the moisture before it comes in contact with cold walls and ceiling surfaces will do the job.

Despite the fact that many farmers are experiencing barn weeping for the first time, it is not a new problem. It has always been a factor in warm, tightly constructed livestock buildings. When cows and hens are allowed to run outdoors much of the time or are kept in well-ventilated sheds, the moisture escapes rapidly before the weeping stage is reached; but when highly productive cows and hens are confined in warm, comfortable buildings, the moisture escapes very slowly and devices such as ventilating fans or flues must be installed to change the air fast enough to remove the moisture before it causes trouble.

Now, just a few notes in regard to aluminum paint. It makes a very fine exterior paint for wood under most conditions, but it is very resistant to the passage of water vapor. If aluminum paint is applied to the outside of a barn sided with tongue and groove siding, it usually intensifies the swelling and buckling of the siding boards. However, when applied on the inside of a barn wall, it has the opposite effect, it keeps moisture out of the siding boards and greatly reduces the tendency of the boards to swell and buckle.

It is always safe to use it on the inside of dairy barns and poultry houses, but it is of rather doubtful value on the outside unless the moisture is shut out of the wall by vapor-proof paper or metal covering on the inside of the wall. For buildings containing little moisture inside, such as garages, machinery sheds, open cattle sheds, etc., it may be used on the outside without danger.

Phenothiazine

Remarkable New Substance to Increase Production

Condensed from Sheep Breeder

THE U. S. D. A. recently announced the results of six years of research with the substance phenothiazine, which is prepared from a coal tar derivative and sulphur, and chemically related to sulfanilamide. Government scientists have found the chemical amazingly effective in combating internal and external parasites of the farm and range stock. This substance, declared to be one of the most versatile brought to light in recent years, is also effective as a fungicide and insecticide for plants, and as a control of horn flies and mosquitoes.

In sheep there has been no effective remedy for the nodular worm, although it ranks with the stomach worm as the cause of inefficient gains and actual loss of sheep. At the Agricultural Research Center in Maryland, sheep known to be infested with nodular worms were given a capsule containing about one ounce of phenothiazine. The treatment was almost 100 per cent effective. The treatment also proved to be effective against the stomach worms, bankrupt worms and hookworms. Thus, the scientists declare, it is a one-way treatment for practically all the important internal worm parasites that infect sheep.

For Swine, Sheep and Cattle

(From article by W. E. Swalls, Division of Animal Pathology, Science Services, Dominion D. A., Institute of Animal Parasitology, Macdonald College, Province of Quebec, Canada).

"In 1938, Harwood, Jerstad and Swanson experimented with a sulphur compound, Phenothiazine, as an anthelmintic which could be administered in the feed of swine for the removal of ascarids and nodular worms. It is a light smooth powder, insoluble in water and slightly soluble in alcohol, but is readily oxidized. These experiments showed that, at a dose rate of 1 gram of phenothiazine per kilogram body weight, all the above mentioned parasites were removed. The drug was mixed with four times its weight of food. This was the first demonstration of the anthelmintic power of phenothiazine although the compound has been known to chemists since 1885, and has been used by entomologists as an experimental insecticide since 1935. Knipling has shown that if 0.1 gm. phenothia-

Reprinted by permission from the Sheep Breeder, Chicago, Ill., September, 1940

zine per kilogram body weight is administered to calves, the development of larvae of the horn fly in the faeces, passed after the second and until the sixth day, is prevented. Very recently Harwood, Haberman and Jerstad demonstrated that commercial phenothiazine when administered in food to sheep at a dose rate of 0.5 gm. per 1 lb. body weight, and as 20 per cent of a meal of concentrates after a period of fasting, showed decided promise as an anthelmintic for the removal of hookworms, nodular worms, and probably Haemonchus and Ostertagia. In these experiments with eight sheep, efficacy was 76.7 per cent for hook worms, 90.9 per cent for nodular worms, apparently 100 per cent for Ostertagia, and probably 80 per cent for Haemonchus. * * *"

"The value of phenothiazine as an anthelmintic was discovered by workers in this Bureau, and this discovery has already been corroborated by investigators in Canada and in Australia. Phenothiazine shows promise of becoming the most valuable treatment so far discovered for the removal of parasitic nematodes from sheep, swine, and other farm animals. Although additional investigations on the use of this substance must be conducted, sufficient evidence on the value of this compound as an anthelmintic has been collected already to warrent recommending its use as a treatment for the removal of worms from sheep and swine."

Treatment of Sheep for the Removal of Worms

"For many years copper sulfate solutions containing mixtures of the sulfates of nicotine and copper have been recommended for the removal of gastrointestinal worms from sheep. These treatments have been of value for the control of the common sheep stomach worm (Haemonchus contortus), but of limited value for the control of the numerous other nematode parasites commonly occurring in sheep, namely, "bankrupt" worms. (*Trichostrongylus spp.*) hookworms (*Bunostomum trigonocephalum*) nodular worms (*Oesophagostomum columbianum*), large-mouthed bowel worms (*Chabertia ovina*), and others. Anthelmintics that are more or less effective for the removal of some of these parasites are known, but as a different medicament is required for each species of parasite, effective treatment is dependent upon an accurate diagnosis. Unfortunately, it is difficult to differentiate with certainty the various species of nematodes infecting sheep by a study of the parasite eggs. It has been the general practice to dose sheep regularly for the control of the common stomach worms and to neglect the other types of gastrointestinal

parasites. This practice has led to losses in the fall and winter from bankrupt worms, hookworms, and nodular worms."

Experiments conducted by this Bureau indicate that Phenothiazine is effective for the removal of several species of nematodes from the digestive tract of sheep, such as the common stomach worm (*Haemonchus contortus*), the lesser stomach worm (*Ostertagis spp.*), the bankrupt worm (*Trichostrongylus spp.*) the hookworm (*Bunostomum trigonocephalum*), the large-mouth bowel worm (*Chabertia ovina*), and the nodular worm, (*Oesophagostomum columbianum*). The dose recommended for sheep is 25 grams or approximately one ounce. * * *"

"Following the treatment the urine eliminated by the sheep contains, as already stated, a dye that turns red on exposure to air. To avoid staining of the wool and possible reduction of the value of the fleece, it is advisable to keep treated sheep on thick bedding or on the ground where the urine will be absorbed quickly. Aside from the elimination of stain in the urine, no ill effects on the host animal following treatment have been observed in the course of our investigations."

"It is impossible to state how often sheep should be treated routinely with phenothiazine to control gastrointestinal parasites during the pasture season, since field experiments to determine this point have not been complete as yet. At the present time the best advice that can be given is to treat as often as the sheep show serious symptoms of infestation."

According to experiments of the scientists of the U. S. D. A. a satisfactory dosage of Phenothiazine is as follows:

For Swine—Pigs from 25 to 50 lbs.—8 grams each (Approximately ⅓ ounce.)

For Sheep—Lambs from 40 to 60 lbs.—25 grams each. (Approximately 1 ounce.)

For Calves—from 200 to 300 lbs.—75 grams each. (Approximately 3 ounces.)

One pound of Phenothiazine is sufficient for worming of approximately:

48 Pigs—25 to 50 lbs.

16 Lambs—40 to 60 lbs.

5 Calves—200 to 300 lbs.

Larger animals should have slightly increased dosage, smaller animals may be given a smaller dose.

When the drug is mixed with feed it should be mixed with ground grain of approximately five times its own weight, in other words one pound of phenothiazine should be thoroughly mixed with five pounds of ground grain.

Animals should be sufficiently hungry to thoroughly consume at once all the mixture provided.

Traders' Tricks at the Auction Barns

Condensed from Farm Journal and Farmer's Wife

Robert W. Howard

LIVESTOCK auctions have sprung up so fast these last few years that one could not reasonably expect them to be perfect. And they are not perfect. In some respects plenty of them are not even good.

Fifteen hundred livestock auctions operate daily, weekly or semi-monthly sales in the feeder-and-breeder states this summer. They cost from $675 to $20,000 apiece to set up and from $50 to $700 a week to operate. They make net profits of from $2,000 to $15,000 a year. Last year they handled one out of every four head of livestock sold in the United States.

This growth could not have been made without real merit. On the favorable side of the auction ledger can be entered definite advantages:

1. Short hauls for the producer.
2. Quick sales and low marketing cost.
3. Cash on the line.
4. Convenience for local exchange of livestock.

Properly regulated, auctions may be the means of advancing orderly and cheap marketing for the producers. Yet many of these sales, housed in dirty, shabby buildings, are known to be spreaders of Bang's disease, cholera, scab and black leg. Some of the managers have more tricks at their command than a national convention of magicians. Buyers and scalpers frequently gang up on the auctions that do attempt to give the producer a break.

Lack of uniform regulation is a cause of shortcomings. That, too, may account for the success of those which feature ballyhoo of the "Have a seegar" and "Hi-ya, Bill" variety. The advance of auctions has brought the sometimes overcapitalized and often overbearing dynasty of the terminal markets to a less arrogant state of mind.

Shadow and Dust

It's six o'clock at night. Choose one of the 200 auctions in Iowa, one of the 125 in Missouri, one of the 75 in Ohio, or one of the 20 in Pennsylvania. Drive out to the edge of town. There's the hot, musty tang of live hogs and milling cattle down the wind.

Straight ahead is a clapboard arena, tarpaper roofed, surrounded by stockpens. Hogs grunt from a dozen trucks in the

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yard; cattle bawl from boxcars on the railroad siding. You may wonder, as I did, whether the stock is kept there in order to hold the permanent yardage under 20,000 square feet and thus keep it out of the range of yards supervised by the Packer & Stockyards Act.

Two spotlights cut yellow shafts through a blue haze of tobacco smoke. Gabfests are in full swing among farmers and buyers on the wood benches. A few Herefords stare up from the ring until the drover whacks a rump with his cane. They break into a trot; the yellow light outlines their heads, sets a wild gleam in their eyes. The rest is lost in shadow and dust.

The auctioneer leans against his pulpit, husky from eight hours of pleas and bellows. He growls something about "a fine prime lot from the farm of . . ." His voice dies in the shuffle and smoke, but a man yells "Seven dollars." The auctioneer nods and the owner walks off to the cashier's window to collect his check.

The cattle haven't been inspected by a veterinarian (if it's a hog sale in some locations, the chances are fair that they weren't even vaccinated against cholera). The scales they were weighed on haven't been inspected for six months. The buyer who bid in the lot may have acted for a packer or a commission house but may just as well have acted for the auctioneer or one of the owners. Whoever he was, the auctioneer has protected him from competition, and neither of them made an effort to fix the farmer's price on a grade basis.

Prices on the terminal market, 200 miles away, were $1.50 a hundred higher that day but the farmer was convinced that transportation, yardage and commissions there would have brought his net price below the auction's $7.

However, He Got Cash

But, first and foremost, the owner was going home that night with spot cash.

The auction was still going on when he drove away a half hour later. If it was in Virginia or Kentucky, it may well have stayed open until four o'clock the next morning.

During the last hour the auction owner like many another in Illinois or Missouri, ran through a bunch he had purchased the week before. The auctioneer knocked the lot down to a dummy buyer at $10.50. The price went on the books, but nobody bothered to check on the delivery. That price created a high for the week in that section of the country, and was used in the auction's advertisements in newspapers and on the radio during the next seven days. It brought 50 more farmers into the

next sale, and helped considerably to establish "Trader Jim's" reputation as a public benefactor and the farmer's friend.

Only a few farmers noticed that the packers' buyers made hurried telephone calls just before they started a rush of bidding on choice hogs and steers about five o'clock. The terminal market, 200 miles away, had closed at 3 o'clock.

When the terminal opened for trading at 8 o'clock the next morning, buying was slack and the traders smugly announced that they didn't need many hogs for that day's kill. They had purchased their choice stock at low prices on country auctions the night before. Yet the prices *at the terminal market* for liberally sorted hogs set the official government price for the day and enabled packers to buy choice hogs at the same prices in their own yards or on the auctions that night.

"Pokes" and Scalpers

These and similar tricks have been forced on livestock sales barns since the system was born in the late 1920's. Ninety-five per cent of the auctions are privately owned. In too many of them, the management takes part in the bidding, either directly or through a dummy buyer. Many of the barns permit buyers to purchase stock before the auction opens. Others show preference in order of selling so that farmers are forced to slip the drovers a dollar or two in order to get stock into the ring before the big buyers leave for home. Some auctions cater to scalpers who bybid management-owned stock beyond the reach of the average farm buyer, then proceed to pay a pre-arranged price to the management.

Mid-west auctions have taken up the practice of pig-in-a-poke sales of assorted lots of feeder stock. The feeder is forced to take the entire lot, without the privilege of a weighing or an examination by a veterinary. An auction near Ames, Iowa, recently sold a bunch of abortion reactors in the ring. Auctions near Sioux City have been known to mix old stock that won't sell at the terminal with stringy feeders on this same take-it-or-leave-it type of sale.

Market prices are frequently faked. One section of Ohio has four sets of prices, three by direct buyers and auctions, one by the co-operative. Virginia's efforts to set up a state-wide marketing system have so far met with stolid refusal from the majority of auctioneers. Indiana economists say that 53% of the state's hogs are sold direct or through auctions and that many sales are made after the Indianapolis and Cincinnati terminals close, thus affecting the next day's official prices.

Commission rates vary in auctions just as they do in terminals. Charges by the Producers Co-operative Commission Association at Columbus, Ohio are 13.5c per cwt. on cattle, compared to 14c at the Cleveland and Cincinnati terminals. The same yards charge 24c per cwt. for calves while Cleveland charges 46c and Cincinnati 44c. But Producers Co-operative Commission Association, like the Farm Bureau auctions in California, comes under the 5% of U. S. auctions operated by farmers for farmers on a straight commission basis. This group, operating in clean, airy barns with strict health inspection and sales rules, should be the model and ideal of the entire system.

The average private auction offers lower marketing costs for calves, lambs or lightweight stock when sold by the head or in small lots. But calves sold by carload lots at many midwest auctions are charged 84c or $1.12 per head while the Kansas City terminal charges only 28c and Chicago gets 35c.

The auction's greatest advantage, of course, is low transportation cost and low yardage. Feed costs average 33c a day. Terminal feed costs average 60c per steer per day.

What Can Be Done?

What can be done to preserve the advantages and destroy the evils of auction markets? Plenty, if farm people make up their minds to do it. Puny efforts have been made to set up state inspection services.

As matters stand today, the livestock auction shows these faults:

1. Poor health inspection services.
2. Shady bidding practices.
3. Buyer pressure forcing the management into dishonest weighing and bybidding.
4. Irregular hours that give professional buyers an opportunity to influence government price reports.
5. No uniform system of market reporting.

If, in the opinion of producers, the auction's advantages overshadow the faults, then the system is worth keeping. The faults can be remedied by state legislation, if uniform in enactment, administered with sufficient funds and unfailingly patrolled by the farmer's own organizations. Again, Federal supervision may be the answer.

Garbage — Flies or Flowers?

C. Leavitt Dyer

THE disposal of garbage in the country is always a problem unless pigs are kept. Even in this case there are times during the year when the pigs are too small to perform this service. However there is one method that will not only keep the garbage pail empty, but will turn its contents into black gold —in the form of humus.

Many farmers accomplish this by burying the garbage in the manure pile, and hauling it out with the manure but this is not a very satisfactory method as dogs are apt to dig it out, and it attracts flies.

A simple way of turning garbage into humus and doing away with the fly nuisance is to build two containers side by side. These may vary in size, but containers 8 feet by 8 feet will be adequate for the average family. Two lines of posts should be planted, the lines being 8 feet apart and 16 feet long. The posts should be set 4 feet apart in the line. Set a post half way between the two lines at each end, and one in the center half way between the rows, thus forming two squares 8 feet by 8 feet. These squares should now be boxed in carefully so that no cracks are left between the boards where flies may enter. In the front of each box a door should be built through which the contents of the box may later be shoveled. The division between the two containers does not have to be built as carefully, as flies will not be a problem there.

To build the top, two 2 x 4's are laid the length of the structure, spaced so that they are 2½ feet from each wall and leaving 3 feet between. This is then boarded over, leaving two trap doors 3 feet by 3 feet in the center of each box. These doors may be hinged or just lifted off. The height of these boxes will also depend on the amount of garbage to be disposed of. For the average farm family, a box 5 foot high will be sufficient. Therefore 8 foot posts must be used, as 3 feet of their length will be in the ground.

When the boxes are ready for use the garbage should be emptied into one of the boxes until it is full. In order to hasten its change into humus the following mixture of fertilizers should be used.

Fertilizer Mixture

75 lbs. Sulphate of Ammonium

50 lbs. superphosphate (acid phosphate)

100 lbs. limestone

The contents of the pail should be spread evenly inside of the box, and the fertilizer sprinkled liberally on top. The ingredients of the mixture may be bought at any store handling fertilizers, and may be mixed up on a wooden or concrete floor with a shovel. It may be stored in bags in a dry place. It is advisable to stand the bags on boards if the floor is concrete. The above quantity will rot down a little over a ton of garbage. As a general rule one pound of fertilizer to every ten pounds of garbage is sufficient. If the garbage consists of pea pods, corn husks, or similar material not as much fertilizer need be used. Grass clippings, dead leaves or any waste plant material may be put into the box. It is not advisable to use any diseased plant material, as it may carry over into the garden when the humus is used. This is also true of certain weed seeds such as crab grass. When one box is full it should be closed up and left for a number of months until its entire contents have turned into humus. The time required will vary according to the temperature of the outside air. In summer, rotting will take place more quickly than in winter. If the second box becomes full before the first one is ready to be emptied, it shows that there is too great a quantity of garbage for the size of the container, and a third box should be built.

In very dry regions, or when there has been a prolonged drought, the rotting process will be hastened if two or three pails of water are thrown on top of the pile, for the contents of the boxes should at all times be moist—not soaking wet, but damp.

When the time comes to empty the box, the owner will find that he truly has "black gold," for this material not only is humus, but is humus fortified with nitrogen, phosphorous and lime. This "black gold" when mixed with any garden soil will greatly improve plant growth.

Grain for Turkeys

Condensed from Turkey World

F. N. Barrett

Michigan State College

AFTER working for several years in developing suitable mashes for growing and finishing market turkeys, the turkey industry suddenly realizes that it really does not know much about the grain part of the diet and possible factors that might influence the proportion of grain to mash that the birds consume.

In fact, is it really known what is the best grain for turkeys, and should only one grain or a combination of grains be fed for the best and cheapest results? What is the effect of mashes of different protein levels on the proportion of grain consumed and the resulting cost? What might the birds tell us if they had a free-choice of several grains? Is it possible that certain grains might be preferred during the growing period and others at the finish? These and other questions are the reasons for the start of some grain studies by the author and his co-workers, Prof. C. G. Card and Ashley Berridge, Michigan State College, in an attempt to lower production costs. While this article is only a progress report on some of our observations, the subject seems to suggest some interesting possibilities, and we still do not know all the answers.

In conducting feeding studies, it is necessary, of course, to keep the birds under controlled conditions, without access to the ground, which means some system of moderate confinement must be used. With our work, the young poults were started in floor pens and, when six weeks of age, were removed to an open front turkey house where each lot of 25 birds was confined in a pen 10 by 24 ft. until marketed. The young birds received only starting mash, water and some cut green feed until eight weeks of age, after which time they also received unlimited grain until maturity. In some instances, a change of mash was made at either the eighth or twelfth week, while with others the same mash was used for the entire period. The mash and grain were available at all times in hoppers. When a free-choice of different grains was considered, each grain was presented in an equal man-

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ner, and the arrangement was changed each week at weighing time. The duration of these trials was 24 weeks, and all calculations are on this basis.

Most turkey feeders are naturally interested in using as high a percentage as possible of home-grown grains, since the price of grain is usually not over half that of mash. Grain is relished by the birds up to a certain point, but they must have some source of additional protein, as well as certain vitamins and minerals to make normal growth. The mash has been found to be a convenient carrier of these supplements. Mashes usually consist of a mixture of ground cereals or cereal products together with the necessary protein, vitamin and mineral supplements sufficient to balance the daily diet. Turkeys have a higher protein requirement than chickens. The protein content of turkey mashes ranges from about 22 to 28 percent. In recent years, the trend has been toward the higher protein mashes rather than those of lower level. One of the most recent additions in the mash field is one particularly rich in the usual supplements, and is known as a concentrate or concentrate mash. These concentrate mashes have a protein content of around 30 percent and are commonly used from the eighth week on to maturity with grain as well as the mash being hopper fed. Hopper feeding, which means keeping feed before birds at all times, has been steadily gaining in favor among turkey raisers and apparently gives quicker and cheaper gains than the feeding of only limited amounts. This is especially true when the birds are kept under confinement or semi-confinement conditions.

Apparently, turkeys are not easily fooled regarding their own dietary requirements. *If we feed a low protein mash, they eat more of it and less of the grain to satisfy their body requirements. When we feed a relatively high protein mash, they eat a smaller proportion of mash and a much greater proportion of the grain.* If we can buy a 20 or 22 percent growing mash for $5 or $10 per ton less than a 26 or 27 percent mash, it does not necessarily mean that we will have cheaper gains. In fact, the gains may be even more expensive, due to the smaller proportion of the cheaper grain which they will eat.

When the entire feeding period is considered, the combined grain and mash consumed by our turkeys to make a pound of gain ranged from 4.10 to 4.85 lbs. The grain percentage of these totals was varied from as low as 19 percent to as high as 64.9 percent. The cost per pound of gain has tended to decrease in a very consistent manner as the proportion

of grain has increased. Let's look at some actual cases.

Our present series of feeding trials was started in 1935. At that time, we were using a mash with a 23 percent protein content which was better than any mash that we had used previously. With this mash the birds would consume approximately 25 percent of grain and 75 percent of mash as an average of the entire period. Later, the protein supplements were increased in this mash until it reached a 27 percent level. This gave better early growth and from 1 to 1½ lbs. better weight at the finish. The grain intake moved up to 30 percent. This has remained our check mash, and all other mashes are compared with it as to perfectness of development, costs, and other characteristics. Later attempts at reducing costs with mashes of lower protein content did not work out so well as to desirable growth characteristics, and the grain intake was generally low, so there was not much saving, if any at all.

From some of our growers came a question regarding the possibility of starting poults on an excellent high protein turkey starting mash, and then switching at either the eighth or twelfth week of age to a very good 18 percent protein growing mash that gave splendid growth results with chickens. This lower protein mash could be purchased at $10 less per ton than the higher protein ration. We tried a switch in mashes at both of the above ages as compared with continuing throughout on the higher protein mash. The results were that both of the pens on the low protein growing mash ate so much of the mash and so little grain that final costs were no cheaper than with the pens which were continued on the more expensive but higher protein mash. The pens on the lower protein grower consumed only 19 percent of grain as compared to 31 percent of grain for the latter, and they were behind in weight and finish at 24 weeks of age. This didn't seem to be the answer to the problem.

Probably the most encouraging results came in our 1938 trials when a free-choice feeding of several grains was undertaken with both a 27 percent protein mash and a 31 percent concentrate mash. Corn, wheat, oats and barley were hopper-fed in an equal and free-choice manner to three pens of 25 birds each. Duplicate trials were made with the concentrate mash, and one trial was run with our standard 27 percent mash with these same four grains. As a check on the results, one pen was fed the 27 percent mash and received only one grain which was corn. All of the 100 birds used were fed in equal

manner until eight weeks of age at which time two of the pens were switched to the concentrate mash, and the grain feeding was started with all the pens. The birds in the pens receiving a free-choice of grains all ate grains very eagerly.

The final results were that the birds on the two concentrate mashes consumed an average of 51.2 percent of their total feed in grain which was the heaviest grain consumption we had obtained to date. It was expected that the high protein concentrate would bring about a large grain intake, but it was surprising to note that the standard check mash of 27 percent protein followed the same general pattern with reference to the proportion of grain and mash consumed as well as the choice of grains. The birds on this latter mash consumed 49.6 percent of grain, by choice, as compared with 30 percent grain for the same mash with only corn for grain. At prevailing prices, the two concentrate mashes had a feed cost per pound of gain of 6.8 and 7.0 cents, respectively, as compared with 6.7 cents for the birds on the standard mash, with free choice of grains, and 8.0 cents for the same ration with corn as the only grain provided. It is of interest to note that the birds consumed more pounds of oats than any other single grain and were consistent in this respect in all three pens. Oats was eaten eagerly from the start of the grain feeding to the finish and was the preferred grain during the final weeks in total pounds consumed. Wheat rather than corn gained in position at the finish. Corn was eaten rather indifferently by the two pens on the concentrate mash. Although the quality of the barley was good, the birds ate sparingly of it. There was no noticeable difference in the final quality of the birds and practically all were of top grade.

These same trials were repeated in 1939 with practically the same results.

What is the answer to this increase in grain, especially as may be noted with the 27 percent protein mash? Is it the greater grain interest because of the variety, or is it due to the unusual liking for oats? Why are turkeys so consistent in their enthusiasm for oats? Is it a desire for more bulky foods or do oats contain some nutrient that is wanted in larger amounts than is otherwise provided? Is it necessary to feed as many as four grains to obtain similar results? Probably not. During the present season, we are continuing these trials with corn and oats as the grain, and we expect to see a reduction in cost over a similar diet where corn alone is used. We are still searching for the answers.

Ranching is a Big Business

Condensed from The Nebraska Farmer

Tom Leadley

HOW much is 100,000 acres? If laid end to end, one rod wide and 160 rods long (the area of an acre), 100,000 acres would extend for 50,000 miles—twice around the earth.

If laid end to end in quarter sections, 100,000 acres would comprise an area approximately 312 miles long and one-half mile wide—three-fourths the length of Nebraska.

In the Nebraska sandhill cattle country are several ranches of 100,000 acres or more in size, but so far as is known only one Nebraska ranch of that size is owned entirely by one man. That is the Everett Eldred ranch, located about 35 miles southeast of Alliance in Garden county. Mr. Eldred lives on the ranch, and spends practically all of his time directing its management and operations. His cattle kingdom stretches for miles across green carpeted hills and valleys, on which thousands of white face cattle graze and grow fat in summer, and winter on the choice, nutritious hay of the numerous meadows, which cut thousands of tons. Dotted here and there over this vast cattle empire are lakes, hay stack yards, wells and windmills, and headquarters for handling such a huge enterprise.

Mr. Eldred's rise to success as the state's biggest individual rancher is the story of a man who came up the hard way, starting as a homesteader within the boundaries of his present large ranch. That was in 1888, when he came to Garden county from Saline county, bringing with him as his only possession 150 cows, worth about $10 a head. The nearest land office was Sidney, where he filed on a tree claim and homesteaded 320 acres. A preemption would have cost $1.25 an acre, but Mr. Eldred didn't have enough money for that.

Those early years held many hardships, Mr. Eldred recalls. Talk about the present dry cycle breaking all records! Seven dry years in the 90's nearly broke Mr. Eldred, when all the lakes went dry and range and hay were short. In those days cattle weren't very numerous on the range, and ranchers could cut hay anywhere. The Ogallala Land and Cattle Company ran a herd of 75,000 head, which had been turned on the range at North Platte, and gradually expanded over the territory to the north-

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west. These cattle were moved out as fence laws began to be enforced, and free range became a thing of the past in Nebraska. But across the line in Wyoming range was still free, and to that state the free-range operators moved.

In 1894 the Kincaide law was passed, increasing the size of homesteads, and Mr. Eldred's grazing land was all cut up by homesteaders from whom he had to lease land at $100 a section per year. When the homsteaders proved up he bought them out, paying $2,000 to $3,000 a section. He has been at this land-buying job ever since, and paid as high as $20 an acre for hay land in 1929. Five dollars an acre has been about the average price paid for range land. Mr. Eldred modestly refers to his extensive land ownings and the number of cattle owned by him.

In normal years about 10 acres are required to graze an animal, but the ranch is not always that heavily stocked. In the more severe dry years he has had to move some of his cattle elsewhere for grazing. A most important asset on a big cattle ranch is a good hay meadow. He endeavors to improve his meadows by seeding clover, timothy and red top, and he cuts about 10,000 tons of hay a year.

The operation of a cattle ranch of this size is a big job, as it is on many similar ranches in northwest Nebraska. Ranching operations group themselves logically into about four main divisions: There is calving time in late winter and early spring when the new arrivals and their mothers must be looked after carefully, and safeguarded from sudden storms. Later in the spring come branding, dehorning, vaccination and dipping. Next is haying, a big job, and then the fall roundup and marketing. All winter the men are kept busy haying the herds. Fence riding and repairs and well and windmill inspection are a year-around job.

Branding, vaccination and dehorning are done on the range, and dipping is in specially built vats in which 3,000 head can be dipped a day. Two or three riders are employed to do nothing but ride fence, and inspect the herd and water supplies. There are about 300 miles of fence on the Eldred ranch so you can see that the riders would have to keep going to inspect it reasonably often.

A good repair shop is indispensable on a large cattle ranch. The town is too far away to go for hurry-up repairs, and there are so many jobs the shop can do that it is economical to have one.

Food is bought in large quantities for the hired help. Before haying the Eldreds usually lay in about 20 sacks of sugar, a

couple tons of flour, and huge supplies of canned goods. Each hay crew has its own cook wagon. The ranch employs a trucker who does nothing else but haul supplies to the ranch. At each of four headquarters is a foreman.

So important does Mr. Eldred regard the calf crop that he has built a calf barn or heifer hospital for the two-year-old heifers calving for the first time. He keeps them in near-by pastures at that season and watches them closely.

A carload of bulls is bought every year, and the bull herd averages about 125 in number. Cows are kept until they are eight to ten years old. The average calf crop is about 75 percent. Cattle from the Eldred herd are sold as yearlings, two-year-olds, and three-year-olds, depending upon the market outlook and feed supplies.

About thirteen hired men are employed on the Eldred ranch the year around, and during the haying season as many as 50 are kept busy. Several different headquarters are maintained on the ranch, which is about 25 miles across the longest way.

Another important asset on a good cattle ranch is plenty of water. Mr. Eldrich has four miles of Blue creek within his ranch, and several fresh water lakes, and in addition has plenty of good wells and water tanks.

Haying is a rather spectacular operation on the ranch. He runs three crews, each comprising four mowers, one stacker, two rakes and three sweeps. The haying season continues for about eight weeks, beginning the middle of July. The Eldred ranch is pretty much of a horse ranch, too, because he uses horses for every ranch operation, and owns about 250 head.

It is the practice of Mr. Eldred, as it is of other ranchers in that section, to move the hay stacks to stack yards each fall so that the cattle may have free run of the hay meadows.

Protein concentrates are fed to the cows and calves in winter. Mr. Eldred believes in good breeding stock, and has always maintained a herd of well-bred cattle. The cows are all well-bred grades, and the bulls are pure-bred.

Mr. Eldred recalls many interesting incidents of his ranching experience. One of them is the bad storm of 1913 in which he lost 900 head in one night. That was on March 13, 1913. The storm was a regular blizzard. The snow fell all day and there was about one foot of light snow on the ground at six o'clock that night when a 50-mile wind came up and drove the blinding snow through the air in a mad fury. It was almost impossible for a man or animals to breathe. Some of the cattle apparently suffo-

cated, some drifted into the lake, and others were buried under snow drifts. That was the worst storm and the heaviest loss he has experienced in 50 years. The storm lasted for 24 hours.

I asked Mr. Eldred about some of his big sales. Several times he has marketed $50,000 worth of yearlings. Last fall one purchaser bought 2,500 head of steers and heifers. These were delivered in three different bunches, and a special train was necessary each time to ship them.

Mr. Eldred thinks the Nebraska sandhills is the best cattle country anywhere, because it has good range and hay, plenty of water and natural shelter.

The Most from the Motor

Condensed from Successful Farming

Leonard Westrate

ON any farm job to which power can be applied, a quarter-horsepower electric motor will easily do the work of one man. For five cents or less (one kilowatt hour) large and small motors will: shell 20 to 30 bushels of corn, cut and elevate a ton of silage, milk 20 to 25 cows with a portable milking machine, saw a cord of wood, shear 75 sheep, run a sewing machine for 30 hours, and put the family washing machine over the biggest wash hurdle. Cost will be lower per job as more power is used.

That's a lot of work for little money but, as with other "hired men," to get the most from the modern and portable electric motor it is necessary to spend a little time on the energy-supply angle.

We asked H. J. Gallagher, rural electrification director for a Michigan power company, to tell us from his years of farm power experience something about today's motors, their work capacities, and—just as important—the points along their "lifelines" of transformer, wire, and switch that makes a big difference in operation.

First comes the transformer—the bottleneck between your farm and the main line. It is this unit which squeezes the current down from several thousand volts to where it is usable on regular electrical equipment. Size limits the amount of energy you can use; don't make the mistake of putting in a transformer adequate for the present which is too small to take care of future needs. Transformers usually come in three sizes. The 1½ Kva. size will handle only illumination and minor household appliances such as refrigerator, clock, vacuum sweeper, and possibly a small iron. The next size, three Kva., will take care of all appliances, illumination, and small motors. The normal farm size is the five Kva., satisfactory for all requirements up to and including a five-horsepower motor and electric range.

The next stop on the lifeline is the entrance service switch; size here is just as important as that of the transformer. It is the service entrance which distributes the energy to all circuits and, if it is too small, it will not feed enough current through the wires to satisfy maximum demands. A 100-ampere entrance switch is

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strongly recommended as being far and away most satisfactory. With this size you could turn on all the lights, have your electric range going full blast, operate all household appliances, pump water, and still have plenty of current for a five-horsepower motor —all at the same time. Under no condition install less than a 60-ampere service switch. And remember that, although you may not plan for large motors or a range in the immediate future, it is still economy to install a switch to accommodate ultimate loads because it would cost three times as much to replace a switch by a larger one later on. In fact, replacement of any equipment costs more.

The circuit is the pathway of the electrical current, and wiring is next on the motor lifeline. A general recommendation is to provide a separate 220-volt circuit for all motors larger than one-half horsepower. For extensions of up to 100 feet only the following scale is recommended:

Size of Motor	Size of Wire
1 horsepower	No. 12
2 horsepower	No. 10
3 horsepower	No. 8
5 horsepower	No. 6

For each 100 feet additional, increase the wire by one size. Extensions of more than 1,000 feet are not practical.

The house itself should have a basement service circuit of No. 12 wire; one of No. 14, for all first-floor lighting and convenience outlets; one of No. 14 for second-floor and attic service. In either house or barn a circuit of No. 14 wire should never carry more than 1,200 watts nor should it have more than 12 outlets. If more wattage is needed, add another circuit. *Never* use wire lighter than No. 14 for any circuit, as it is likely to overheat from resistance against an overload.

If you have ever discussed barn-wiring with anyone, it is a gilt-edged bet that you have been told that the *only* way to do the job is to run the wires *thru* rigid or flexible metal ducts. Not necessarily, says our friend Gallagher; non-metallic sheathed cable is more practical for farm use.

As a final word before we get to the motor, don't forget that a fuse of the proper size for the carrying capacity of the circuit is an absolute necessity to protect your wiring. It will not, however, protect your motor except in extreme overloads.

Motors come in three general types: split-phase, capacitor, and repulsion-induction.

The inexpensive split-phase is satisfactory for equipment having such light starting requirements as washing machines, emery wheels, fanning mills, grindstones,

and so on. Automatic overload control should be installed with the motor.

The capacitor type is found in more general use; the cylindrical container on top of the motor is the capacitor or condenser which aids in giving greater starting power without causing excessive voltage drop or "light flicker." This type will give satisfactory service on equipment imposing medium starting load such as water-pumps, cream-separators, concrete-mixers, and so on.

Equipment starting under heavy load—deep-well pumps, refrigerator compressors, and so on—should be powered by the repulsion-induction motors.

But irrespective of the type of motor required, an adequate, separate control in addition to circuit protection should be used with each motor of one-half horsepower and larger, to avoid danger of burnouts. Fuses are not always satisfactory, as a fuse having the same rating as the motor may "blow" due to a harmless momentary overload. If a larger fuse is used to allow for the starting load and momentary overloads, it may not protect the motor in case of a prolonged, small overload. For these reasons, controls employing the thermal type of overload protection usually are desirable. With this type, the motor overload protection comes into play only when the temperature of the motor windings exceeds a safe value. But the important thing is: always use *some* type of overload protection.

A few years ago the talk was all of big electric motors: five, seven, and even 10 horsepower. Now the trend is toward three, two, one, and fractional horsepower sizes. With tractors coming into use universally, investment in a large motor for only a few days' work each year—silo-filling or other special jobs—has not proved a paying proposition. Only where the work is heavy and where comparison against tractor or custom cost has proved it sound is the use of large motors advisable.

For all-around farm use, the one-fourth horsepower motor fits best. Weighing approximately 30 pounds, it can be shifted to power many pieces of equipment. The only materials needed to mount a one-fourth horsepower motor are a rounded mounting rail for one edge of the motor base, two bolts, and a pully. The rail may be of hardwood—a piece of broomstick handle—or of iron pipe. The rail is bolted thru two of the holes in the base; it is then dropped between two cleats on workbench, floor, or machine frame. The cleats should be so located that the motor will tip up slightly when belted to the driven machine. When this is done the

weight of the motor automatically keeps the belt tight. The lower side of the belt in this case should be the pulling side to eliminate any tendency for the motor to climb the belt.

An inexpensive truck can also be made for a one- thru five-horsepower motor, the design depending upon the weight of the motor to keep the belt tight just as it did in the case of the cleated job.

The front end of the truck can be designed to pivot on a yoke fastened to the driven machine, using a belt just long enough to keep the opposite end of the truck's platform from resting on the ground.

With your motor so mounted, it is but the work of a minute to attach it to the driven machine. The motor is wheeled into position and a hinge pin is inserted which fastens the front end of the truck to the yoke on the driven machine. Either a fixed, one-piece, or a removable handle may be used.

A third type of mounting, the simple base-and-hinge, is made up by attaching motor to a solid wood base to one end of which is fastened half a good hinge with removable pin. Half hinges are also fastened to the frames of other pieces of equipment to be powered, and the base and half hinge are hooked on as needed, the weight of the hinged motor keeping the belt pulling.

So hooked up and so supplied with safe current, your portable electric motor should keep humming along at work for many a year, really "another man" on the place and one who asks only to be shown the job.

Fire Departments for the Farm

Condensed from Farm and Ranch

Leon J. McDonald

OBTAINING support and co-ordinating the manpower of practically every local and state agency in an intensive campaign to make the people of the district "fire-conscious," perfecting an organization with a membership of more than 4,000, and demonstrating that an economical and practical fire department can be had on every farm, summarizes briefly the accomplishments of the supervisors of the Arkansas-Verdigris Soil Conservation District of Oklahoma.

This District comprises, approximately 665 square miles of territory lying between the Arkansas and Verdigris rivers in northeastern Oklahoma.

There are approximately 4,000 farms in this area, totaling 382,000 acres, 145,000 acres of which consists of native woodlands and pastures. More than two-thirds of the farm operators are tenants whose average tenure is less than two years per farm. However, the majority of them move to farms near by and are, therefore, interested in the affairs of the various communities.

This entire area has been subject, more or less, to a large number of prairie and woodland fires during the past few years. Many of these fires have been very destructive. Native meadows, pastures and woodlands have been practically destroyed by numerous burnings. Feed crops have been destroyed and good money has been spent for hay and feed to replace that destroyed by fire. Many of the farmers had become interested in some kind of fire protection. The large cities, even the smaller communities of the district, had organized fire protection—volunteer fire departments. Why should the farmers be left without any protection? What could they do? Those were the questions being asked by many who had experienced severe losses.

The answer to the above questions became apparent when more than 200 farmers of the district, many of whom had signed co-operative agreements with the district, answered the call of the supervisors to attend a meeting in Broken Arrow, Oklahoma, to discuss the situation. Representatives of the Banker's Association, Chamber of Commerce, Farmers Union, Extension Service, Vocational Agriculture, the

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CCC, Soil Conservation Service, schools, and other interested organizations attended the meeting. The county attorney of Tulsa county explained the State Fire Law passed by the sixteenth session of the Oklahoma Legislature, 1936-37, emphasizing the penalties for violators. Many individuals participated in the discussion. It was decided to form an organization, elect officers and empower them to perfect plans subject to approval of an Advisory Committee representative of all interests in the district. The Farmer's Union, District Supervisors, Chamber of Commerce, and Soil Conservation Service were represented on the official board.

The advisory committee, consisting of thirty members, met in the District Office September 6 to adopt a program and carry out the mandate of the August 22 meeting.

The program as adopted included an educational campaign, its objective being to make the people "fire conscious" and to demonstrate practical and economical methods of not only prevention of fires but the suppression of them. Assurances were given that the association, named, The A-V Fire Suppression Association, would be given the support of every agency represented on the advisory committee.

The week of September 25-29, inclusive, was designated as fire suppression week in the district. Twenty group meetings were held in schools, community sale pavilions, boy scout rooms, community centers and farmers union locals in the interest of the program. 4,775 people attended the meetings and more than 4,000 signed membership cards. The average program consisted of showing of two films, "The River," a U. S. D. A. product, and "Farm Inconveniences," an International Harvester Company film, by a representative of the State Forestry Service who participated in every meeting. A district technician gave a ten-minute demonstration in which exhibits of burned fence posts, wild plum bushes, berry vines, meadows and pastures were shown. He pointed out the economic loss, destruction of wildlife habitat, feed, soil and moisture losses as a result of burning. The superintendent or foreman of the CCC camp and several enrollees demonstrated a model farm fire department and the proper methods of suppressing a fire once it got under way. Several kinds of educational posters were given to schools for display on bulletin boards and in class rooms. A copy of the State Fire Law was given to every one attending a meeting. Newspapers and radios helped to carry the message throughout the district.

The follow-up program has been intense. Farm women's clubs, F. F. A. Chapters, Farmer's Union locals and 4-H Clubs have told the story. Stencils were given to individual farmers and organizations for painting of signs on fire units. A two-act play has been written and is being used by 4-H Clubs and F. F. A. chapters for assemblies and community gatherings. Educational tours to observe individual and community fire fighting units as well as fire pre-suppression work have been held.

The superintendent of the CCC Camp at Broken Arrow has a map of the district upon which is shown the location of every farm fire department. This information enables his foreman and field crews to co-operate very effectively with local farmers in suppression of any fire. This preparedness program enabled the camp to put out a recent fire, potentially, very serious, in a very few minutes. Two fire department units of nearby farmers were used.

How to Feed Soft Corn

Condensed from The Farmer

W. H. Peters
Livestock Editor of The Farmer

THAT at least some of the mammoth corn crop of 1940 will not get ripe enough to husk, crib and store is a pretty safe prediction. Just how much of it will be soft or just how soft it will be remains to be seen. How difficult will be the problem of feeding it in order to salvage the largest possible feeding value from it will depend on just how green it may be at the time of the first severe frost and upon the type of weather that will follow through those weeks after the first killing frost and before the winter freeze-up.

The largest feeding value per acre of soft corn can be secured by making silage of it. Soft corn silage is no higher in feeding value or perhaps not quite as high ton for ton as silage from corn that is nearly mature at normal silo filling time. No large part of the crop over and above the acreage normally used as silage can therefore be salvaged in this way. Perhaps a somewhat larger acreage than usual can be used to good advantage as corn fodder because the soft ears will keep quite well if the stalks are cut and shocked and fed out as

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bundle corn through the fall and winter months.

It might pay to allow corn to stand in the field several weeks after the killing frost and then cut it. The stalks will have less feeding value, but the ears may dry enough and improve enough in feeding value to make up for the loss in leaching of the stalks and leaves.

Should a high percentage of the corn crop be caught by a heavy frost before it is ripe, it will be necessary to let it stand in the field as long as it seems safe in the hope that it will dry out enough so that it can be cribbed on the cob. In a normal year, corn contains 18 to 24% moisture when it is husked and cribbed on the cob. Such corn drys normally down to 14 to 16% moisture in the crib. Just how much moisture corn in the ear may contain and yet dry out enough to keep when cribbed will depend on how it is cribbed. In narrow, well-ventilated cribs, it is safe to crib at 25 to 27% moisture and under favorable dry weather conditions after cribbing, corn containing 30% moisture will stand a good chance of keeping. Ear corn containing more than 30% moisture is very likely to rot if put in the crib, even though it is in narrow, well-ventilated cribs.

Soft corn is not as high in feeding value pound for pound as mature corn, simply because it is more bulky, due to its higher water content. Animals eating soft corn do not do as well as animals eating mature corn because in eating 100 pounds of soft corn they get less dry matter and digestible nutrients than when they eat 100 pounds of mature corn. If soft corn is artificially dried down to the same moisture content as mature corn, animals will do just as well on it as on mature corn.

Rules for Feeding Soft Corn

Two or three rules may be cited for feeding soft corn to any type of fattening animal:

(1) Feed all of the soft corn they will eat and do not expect fattening cattle or lambs to eat quite as much dry roughage or silage as they would if fed with good sound corn.

(2) Feed a protein supplement with soft corn. This is simply a means of counterbalancing the bulk of the high moisture content of the corn with a rich, highly concentrated supplement. With the immense crop of flax that has been harvested and the immense crop of soybeans to be harvested, linseed meal and soybean meal should be available in large quantities for this purpose through the coming winter.

(3) Hogs seem to be able to utilize soft corn to slightly better advantage than cattle or sheep. This is because corn passes

through the digestive system of the hog faster than through the digestive system of cattle or sheep and the hog can eat proportionately more of it. In feeding soft corn to hogs the corn should be kept in front of them all the time to encourage the greatest possible consumption. They, too, should receive a protein supplement along with the soft corn.

How Will Hybrid Corn Perform?

No doubt many farmers are wondering how hybrid corn will perform in a soft corn year. Dr. H. K. Hayes, plant breeder at the Minnesota Agricultural Experiment Station, under whose direction the Minnesota strains of hybrid corn have been produced, says, "In a soft corn year hybrid corn will have the advantage of uniformity in moisture content. Whenever it gets dry enough so that one ear will keep, then all of it will keep and we will not have the old problem of unevenness in maturity with part of the ears rotting in the crib while others are dry enough to keep. On the other hand, those farmers who have been overambitious in planting hybrids known to be late maturing in order to get large ears and higher yields may find that all of the ears will be extremely soft."

Artificial Drying

Soft corn will have to be fed on the cob at least until the weather gets cold enough to freeze it. Lambs and pigs will do a good job of working the kernels off of the cobs, while cattle will eat cob and all. Once it is frozen solid, soft corn can be shelled, shipped to points where dryers are available, and dried down to a low, normal moisture content and can then be kept into or through the following summer.

Help Soil Feed Livestock

Condensed from The Shorthorn World

FARMERS have long observed that livestock make their best gains following crop rotation in which legumes have been grown, and on soils which have been limed and fertilized.

They also observed that the inoculation of legumes—to permit them to obtain nitrogen from the air—increased the feeding value of crops which followed and improved the nitrogen content of the soil.

These beliefs have now been proved experimentally by the University of Illinois College of Agriculture. Citing experiments at the University, J. C. Hackleman, extension crops specialist, explains that there was a 90-pound increase of protein content in each ton of alfalfa where it was inoculated, compared with uninoculated alfalfa.

Other tests have shown an increase in protein in grasses when accompanied by a legume. When redtop was grown with alsike clover there was an increase of 24 pounds of protein a ton, making the crop $1.23 a ton more valuable. Redtop grown with alfalfa increased the protein content 27 pounds a ton, adding $1.32 a ton to the value of the crop.

Hackleman cited the influence of soil treatment on yield and composition of lespedeza at Ewing. The addition of limestone to a treatment of residue and potash doubled the yield of lespedeza and increased the calcium content of the hay approximately 50 per cent.

On the Morrow plots at the university, soil treatments have not only increased the yield but have improved the feeding value of the corn produced, Hackleman said. On a continuous corn plot without treatment the corn produced 24.8 bushels an acre with a protein content of 4.1 pounds a bushel. On the corn-oats plot without soil treatment the corn yield was 33.5 bushels an acre with a protein content of 4.46 pounds a bushel, while on the corn-oats-clover plot, with a treatment of manure, limestone and phosphate, the yield was raised to 59.1 bushels an acre with a protein content of 5.45 pounds a bushel. On the basis of the present market price of protein in soybean and cottonseed meal, roughly five cents a pound, each bushel of corn produced on the treated land is worth 34 cents a bushel more than corn grown on the untreated land, since there is a difference of 1.35 pounds of protein a bushel in favor of the treated land.

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Cutting Trees to Save the Forests

Condensed from The Western Farm Life

A. S. Cook

LAST September, a telephone right-of-way was cleared through a stand of ponderosa pine saplings on the Harney national forest in South Dakota. This area had been thinned four years previously from about 4,000 trees to the acre to approximately 800 trees to the acre. In other words, about four out of every five trees were cut.

So much emphasis has been placed on saving the forests that the layman sometimes loses sight of the fact that judicious thinning is the very best kind of conservation.

After the right-of-way had been cleared, a survey was made by S. D. Cochran, chief of the Division of Timber Management, United States forest service, Denver, Colorado, who, naturally, was interested to know what effect thinning had had on the growth of the trees.

But even Cochran, with his wide knowledge of forestry and his expert training, was not prepared for what he found. He took a typical tree, which at the time of thinning measured 2.34 inches in diameter and had 45 annual rings, representing 45 years of growth. It was a mere youngster, for these trees often live for several centuries. Now, four years later, the diameter was 3.125 inches. It had increased more than ¾ of an inch, or approximately one-third of the diameter growth of the preceding 45 years! The diameter increased as much in one year after thinning as in three years and nine months before thinning—an increase of almost 400 per cent.

But that isn't all. The volume growth for the last four years, as indicated by basal-area measurements, amounted to 77 per cent of the volume growth during the 45 years preceding, or as much in four years since thinning as during thirty-two years preceding thinning. Eight hundred per cent!

This example is not an isolated case taken from a small test plot. The experiment covered a total area of 250,000 acres, including Colorado, Nebraska, Wyoming, and South Dakota.

"Naturally," Cochran says, "care was taken to remove the poorest trees—the dead, crooked, decadent and 'weed' trees—leaving those with the best chances to make good growth. This not only leaves the forest in far better shape by clearing it of material that is a real fire menace, but allows more growing space.

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Hybrid Corn Proven Best Hog Feed

Condensed from Hog Breeder

B. W. Fairbanks

Associate Chief, Swine Husbandry, University of Illinois, College of Agriculture

WHENEVER good farmers get together, the conversation invariably drifts into a discussion of hybrid corn. Almost any livestock man will put down his feed bucket and give an inquirer his views on one of the livest arguments of the day —hybrid vs. open-pollinated corn.

One reasonable conclusion now seems clear from the results of experiments conducted at the University of Illinois and from other tests with hybrid and open-pollinated varieties of corn: The differences found are not so much differences in hybrid and open-pollinated varieties of corn as they are differences between specific strains of corn regardless of their genetic origin. In other words, it is not so much a question of hybrid vs. open-pollinated as it is a question of strain vs. strain.

Prompting the Illinois experiments were all kinds of claims and counter claims. For instance, in recent issues of a prominent agricultural publication appeared comments by two swine growers, each representing a different side of the hybrid-corn question. One breeder stated that he had lost his enthusiasm for hybrid corn because he felt it must be soaked before hogs could get full benefit of the grain and also because he had observed that the feeding of hybrid corn to hogs in a serum plant had reduced the amount of blood. The other pork producer was equally positive that bybrid corn had definite advantages. He preferred it because it matured much earlier than most open-pollinated varieties and could be fed earlier, thus eliminating the troubles resulting from feeding soft, green corn.

Many of the pros and cons concerning hybrid corn, such as yields and quality, have long since been settled, but apparently little is known of the comparative feeding values of hybrid corn and the open-pollinated strains. It was this question which was attacked in the Illinois experiments. To determine if hybrid strains really possessed a higher feeding value than open-pollinated varieties, as many have supposed, W. E. Carroll, now

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head of the department of animal husbandry, the writer and J. L. Krider conducted what is believed to be the first study of its kind. Of course the results of one experiment can never be considered conclusive, but the findings made in this test are interesting and possibly indicative.

On a farm near Urbana where the soil was reasonably uniform, two standard open-pollinated varieties and two well-known strains of hybrid corn were grown. To get as complete a representation as possible of the crop, we took random samples by traveling diagonally across the field in two directions and shucking ears from every tenth hill. The ears were stored under room conditions for about a month and at the end of that time 10 kernels were taken from the center of each ear to be used in other phases of the experiment.

Fall pigs which resembled each other as much as possible in initial weight, age, sex, litter and probable outcome were distributed into five lots in one wing of the University swine barn. All the pigs in each lot were given a protein supplement and a mineral mixture self-fed and free choice. In Lot 1 a hybrid corn, U. S. 35, was fed; Lot 2 received Illinois Station Dent, an open-pollinated variety; Lot 3 was given another hybrid, Illinois 791, and in Lot 4 another open-pollinated variety, Curry's Improved Yellow Dent, was fed. The fifth lot was given all four of the strains of corn fed in separate compartments of a self-feeder so the animals would not form the habit of going to the same compartment all the time and to force them to hunt the variety of corn they liked best, if there were any preferences. The purpose of this was to discover which of the varieties was the most palatable. This was determined by carefully recording the amount of corn that had been eaten.

In all phases of the experiment the two strains of corn which made the most favorable results were U. S. 35, a hybrid, and Curry's Improved Yellow Dent, an open-pollinated strain.

In feed eaten for 100 pounds of gain the U. S. 35 hybrid made the best record. Pigs in this lot ate 416 pounds of feed for 100 pounds gain, while in the case of the pigs receiving Curry's open-pollinated, 472 pounds of feed were necessary for 100 pounds of gain.

Results of the palatability test were interesting in that the varieties which gave the best rate of gain were also the most palatable. Of all the corn that was eaten, 45 per cent was the hybrid corn, U. S. 36; 29 per cent was the open-pollinated corn, Curry's Improved Yellow Dent; 19 per cent was the hybrid, Illinois 791;

and 7 per cent was the open-pollinated, Illinois Station Dent.

For some time it has been assumed by many that the differences in feeding value of hybrid and open-pollinated varieties of corn traced to hardness. The kernels taken from those ears which had been selected from the field were subjected to numerous tests for hardness, one of these being water absorption based on the assumption that the softest corn would absorb the most water. The corn was also tested for its crushing strength, and for the electric current necessary to crush a given sample. The results with grinding could not be duplicated, and the differences obtained by crushing were not statistically significant. Definite conclusions can be made from the water absorption tests, though, and the results of this phase of the experiment compare favorably with the palatability and rate of gain-tests. Curry's Yellow Dent and U. S. 35 in that order were the softest corns. It was these strains that proved the best for rate of gain and for palatability. Though this experiment has not been conducted long enough to make its results conclusive, it can be fairly safely assumed that palatability and possibly hardness, as this may affect palatability, are factors in feeding value.

Poisonous Plants of the United States

Walter Conrad Muenscher

Professor of Botany, New York State College of Agriculture at Cornell University, Ithaca, New York

NO general treatment of the poisonous plants of the United States has appeared since 1911. The investigations in this interval have contributed very materially to the knowledge of poisonous plants. Many plants which were considered poisonous have been chemically analyzed and toxic substances responsible for their poisonous properties have been isolated and described; other plants formerly only suspected of being poisonous, by feeding or other tests, have been demonstrated to be poisonous under all or only under certain special conditions; still other plants which twenty-five years ago were not even suspected of being poisonous are now definitely known to be so.

Most of these results are products of investigations and experiments by scientists in the United States Department of Agriculture and the State experiment stations, chiefly in those western states where the livestock industry is well developed and closely associated with the utilization of native vegetation for grazing and hay.

Nature and Classification of Poisonous Plants

It is not possible to divide all known plants into two groups, poisonous and non-poisonous. Most plants are harmless. Many are poisonous under some conditions. A few are poisonous under nearly all conditions.

Poisonous plants are those that contain or produce under natural conditions physiologically active or toxic substances in sufficient amounts to cause harmful effects in animals, including man. The quantity of a poisonous plant ordinarily consumed may contain enough of the toxic principle to cause death or only a diseased condition.

The poisonous nature of a plant is caused by the presence of one or more of several kinds of substances:

1. Substances themselves toxic to the animal organism. e.g., the alkaloid, conine, is the toxic principle in the poison hemlock.

2. Substances themselves harmless, but which may decompose to form toxic products either before or soon after they are eaten: e. g., the non-toxic glucoside,

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amygdalin, produced in the wild cherry, hydrolyzes to form the highly toxic prussic acid.

3. Substances formed by the action of micro-organisms on plants or plant products: e. g., fungi under certain conditions produce moldy hay or ensilage, forming decomposition products some of which may be toxic.

The Classification of Poisonous Plants

1. The natural groups of families of plants.
2. The chemical nature and properties of the toxic principle.
3. The physiological action of the toxic principle.
4. The conditions under which poisoning is produced.

The Chemical Nature and Properties of the Toxic Principle

The poisonous properties of a plant may be due to a single chemical, several similar compounds, or to substances with widely different chemical properties. It is, therefore, difficult to classify poisonous plants by their toxic constituents without considerable overlapping. On the other hand, a knowledge of the kind of toxic compound contained in a plant is helpful in diagnosing symptoms of poisoning and recommending treatment.

The Conditions Under Which Poisoning is Produced

Most cases of plant poisoning in man and animals are caused by the toxic principle entering through the digestive tract or, in some cases, by contact with the skin. The plants that cause poisoning by contact, dermatitis, are limited almost entirely to man. In animals the frequency of poisoning is often determined by the availability of more palatable forage and the conditions under which the poisonous plants are eaten. Some poisonous plants cause most trouble when eaten in pastures or on ranges, others when included in hay and coarse feeds, and a few cause trouble only or primarily when fed in ground feeds.

Many plants are poisonous but not under all conditions. Some are toxic or cause poisoning only during certain seasons.

Most cases of stock poisoning occur either in the early spring when the grass is still short and other forage is scarce, or in late summer when the grass is dried up. Some poisonous plants start to produce herbage early in the spring, others remain green long after the green grass is gone. Under such conditions of scarcity of forage, animals are frequently forced to eat poisonous plants which would otherwise be left untouched. A common practice of bringing about a scarcity of forage is by overgrazing of pastures or ranges. Whenever the number of animals grazed to a unit of area is in excess of the palatable

forage required to satisfy their appetites, the incidence of plant poisoning increases. Animals are then prone to consume unwholesome and harmful plants which ordinarily would not be touched.

Plants Poisonous or Injurious Under Special Conditions

A. Plants Causing Dermatitis.

Most poisonous plants, are harmful only when they are eaten. Relatively few plants produce poisoning by contact. The latter poisoning may consist of minor or temporary irritation of the skin or a painful irritation and inflammation with vesicles or blisters. By far the most common cause of plant dermatitis in the United States is poison ivy, Rhus Toxicodendron, and its closely related forms known as poison oak. The poison sumac, Rhus Vernix, in the Northeast and poison-wood, Metopium toxiferum, in the extreme Southeast produce similar and even more severe dermatitis. The parsnip, *Pastinaca sativa,* lady-slippers, *Cypripedium spp.,* spurges, *Euphorbia spp.,* and the cultivated primrose, *Primula obconica,* are other common or widely distributed plants producing a number of cases of dermatitis.

B. Plants Causing Photosensitization (Photodynamic Plants).

For many years contradictory reports have existed concerning the poisonous properties of St. Johns-wort, *Hypericum perforatum,* and related species. Recently it has been shown that the toxic action of St. Johns-wort, buckwheat, and several other plants is influenced by light. These plants appear to contain substances which, when eaten by domestic animals, sensitize them to light so that they may develop serious symptoms when they are exposed to strong sunlight. Plants that sensitize animals to light by substances not normally present in the animal system, have been designated as having a photodynamic action.

Before photosensitization of an animal may take place as a result of eating a plant, certain conditions must be fulfilled. 1. The animal must be white or have an unpigmented skin; otherwise, the pigmented skin or dark fur may "screen out" certain light rays. 2. The animal must ingest the plant in question in sufficient quantity to supply the photodynamic substance. 3. The animal must be exposed to bright sunlight subsequent to feeding on the plant.

If any one of these conditions is not met, symptoms may fail to develop.

C. Cyanogenetic Plants.

A number of species of both wild and cultivated plants are capable under certain conditions of producing hydrocyanic acid, also called prussic acid, a highly poisonous substance. Such plants

are known as cyanogenetic. The poisonous properties are variable, being dependent on the presence of a glucoside, an enzyme capable of hydrolyzing the glucoside, and conditions favorable for the accumulation of lethal amounts of the hydrocyanic acid. Many plants are capable of producing hydrocyanic acid.

D. Introduced Poisonous Ornamental Plants.

A number of introduced ornamental plants frequently grown in gardens and about homes contain very toxic substances, and they must be classed among our most poisonous plants. These common plants are usually well known and recognized by those who grow them, but their poisonous nature is not always appreciated. They should never be eaten by humans or animals. To do so might produce serious poisoning or death.

E. Plants Producing Poisonous Seeds.

Many common plants, mostly of grainfields, produce herbage that may be eaten fresh or when dried in hay by stock without harm. But the seeds of several species of these weeds contain a high concentration of toxic substances. Thus, while the herbage from such plants may be relatively or entirely harmless, the mature seeds are a source of danger. In some sections of the Northwest and in Canada such poisonous seeds frequently form a large proportion of the screenings removed from grain. If these screenings are fed in concentrated form to swine, sheep or cattle, serious illness may result. In many large grain elevators and some mills the screenings obtained are utilized in the manufacture of feeds by mixing them with ground grain, bran, or shorts until they are diluted to harmless proportions.

F. Seleniferous Plants.

Recent investigations have shown that certain native range plants are able to absorb selenium compounds from soils from Cretaceous or Eocene shales in sufficient quantities to make them poisonous to animals. The "alkali disease" and the disease known as "blind staggers" in cattle and horses have been traced to feeding on vegetation made toxic by the absorption of selenium. These two diseases are types of selenium poisoning; the former the chronic type, predominating in South Dakota, develops from eating small amounts of selenium-bearing vegetation over an extensive period; and the latter, the acute type, predominating in Wyoming, results from feeding on relatively large amounts of selenium in a short time. The selenium content of plants growing on soils rich in selenium compounds, such as certain Cretaceous or Eocene shales, may vary

greatly. Some species seem always to contain selenium while others may or may not absorb it. According to Beath and his associates, selenium absorbed from seleniferous shales by certain plants is returned to the soil upon their death and decomposition and becomes available to other native species and even to some crop plants that are unable to absorb inorganic selenium from seleniferous soils directly. By this process, plants ordinarily harmless, through the aid of certain "converter" plants, might become poisonous.

G. Plants Producing Undesirable Flavors in Milk and Milk Products.

A number of poisonous plants, when eaten by cows in sufficient quantity to cause poisoning, also decrease the yield of milk. Other poisonous plants reduce the quality as well as the quantity of milk. Some kinds with disagreeable taste or odor produce no poisoning but may affect the milk and other dairy products and at times even the meat from cows feeding upon them. Such "tainted" products are difficult to market.

In the eastern states, wild garlic and wild onions are the most widespread troublesome milk "tainting" plants. The bitterweed, *Helenium tenuifolium,* is abundant and troublesome in the South. In the northwestern states fanweed, *Thlaspi arvense,* causes disagreeable flavors and odors in milk and dairy products of animals that have fed on the tops or on the seeds in screenings used for feed.

H. Plants Causing Mechanical Injury.

Some plants, though not poisonous, possess hard sharp awns, spines, or thorns which produce mechanical injury to animals. The wounds in and about the mouth and around the eyes of an animal not only may be painful but may serve as channels of infection for bacteria. Swelling and pus formation may result in inability to see and lead to starvation. These structures may also produce serious wounds or obstructions in the alimentary tract.

The above is an excerpt from "Poisonous Plants of the United States" by Walter Conrad Muenscher, Professor of Botany, New York State College of Agriculture, Cornell University. This book is highly recommended to the livestock owner as it first offers a brief study of the nature of poisonous plants, and second, a detailed treatment of the plants themselves. The book is illustrated with seventy-five drawings which will greatly simplify the identification of the various plants.

10,000,000 Pounds of Cotton Go Back to the Farm on Rubber Wheels

Condensed from Acco Press

DURING the current year, it is estimated that 12 per cent of the cotton consumed in the United States will be used by the rubber industry, largely because cotton mills continue to meet new demands of the tire companies for stronger cotton cord. Better engineered cotton cord, now used in truck and bus tires, results in an average of 30,000 to 40,000 miles, a tremendous increase over time mileage of 10 years ago. This tougher cord is used in the huge 30.00-40 Firestone Earthmover Tires, which carry weights as high as 22½ tons per tire. Each of these tires contains more than one bale of cotton.

Farm implement tires and tractor tires in 1940 will consume about 10,000,000 pounds of cotton. The Firestone Tire & Rubber Company, one of the large cotton purchasers in the industry, estimates it will spend $9,000,000 for cotton in the primary markets throughout the southern cotton-growing states. This company will purchase about 125,000 bales of cotton for its own cotton mills in Gastonia, N. C., and New Bedford, Mass., and about 15,000 bales of processed cotton from other mills.

To supply the year's cotton requirements to the Firestone Company, more than 277,000 acres, or almost 440 square miles, will be cultivated and harvested in the cotton-growing southern states. This cotton will range in staple length from seven-eighths of an inch to one and three-sixteenths inches.

The importance of cotton as a large-quantity raw material in the tire industry increased sharply when high pressure tires were replaced by balloon tires in 1923. The larger tires manufactured from year to year since that time have used more and more cotton fabric. Development of larger, more heat-resistant tires by the rubber companies led to the adoption of pneumatic tires as standard equipment on trucks and buses, opening up a great new commercial tire market. The next major development of importance to the cotton industry occurred when tires for tractors and farm implements were introduced. Development of this market kept many cotton fields under cultivation through the de-

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pression years and, in 1939, chiefly because of the increased demand for large tractor tires, total cotton consumption by the rubber industry reached an all-time high of 980,000 bales, including 210,000 bales used by rubber companies for products other than tires.

Since 1932 the trend toward pneumatic tire equipment for all tractors has been phenomenal. Six out of every seven farmers who bought new tractors insisted upon rubber tires in 1939. Today, one out of every three tractors on American farms is rubber-tired!

The fact that an average 10.00-38 Ground-Grip tractor tire uses 17.7 pounds of cotton does not impress the average cotton grower until he realizes that early in 1940 nearly 600,000 tractors were rolling on rubber tires, and that today 86.2 percent of all tractors turned out are equipped with rubber tires—each large rear tire containing 17.7 pounds of cotton.

Reason for rapid acceptance of tires by the farmer is to be found in the savings such tires provide. Last September, the Agricultural Engineering Section of Iowa State College published a summary of the experiences of farmers who have used 199 sets of pneumatic tractor tires, representing a total of 381 years of rubber tire experience. It found that with rubber tires:

1. Estimated fuel savings ranged up to 50 per cent and averaged 22 per cent.

2. Labor savings ranged from 5 to 50 per cent and averaged 25 per cent.

3. Although pneumatic tires cost about $200 for a two plow, all purpose tractor (or 20 per cent of the total cost) they increased its capacity by slightly more than this percentage. In addition, they save sufficient fuel and time to pay for themselves. "These savings of fuel and labor would amount to about 80 cents per day." Fifty days or "500 hours of work" would justify the annual expenditure of $40 for the use of a set of tires.

As to traction and speed possible with pneumatic tires, the Iowa State College found that

Year	Tractors Sold On Rubber	Tractors Sold On Steel	Changeover To Rubber	Total on Rubber
1932	0	14,250	0	0
1933	900	15,810	3,000	3,900
1934	4,600	42,500	7,300	11,900
1935	17,800	106,500	19,600	37,400
1936	50,700	110,911	27,100	77,800
1937	92,400	123,803	36,600	129,000
1938	98,000	45,749	38,500	136,500
1939	133,900	35,471	45,350	179,250
Totals	398,300	349,264	177,450	575,750

they decreased the amount of horsepower necessary to pull the test implements on an average of 44 per cent.

The eagerness with which farmers have adopted rubber tires for tractors is readily seen in the table which portrays the growth of the tractor tire market.

With the 1940 estimate of total original equipment and trade sales of tractor tires approaching the 1,000,000 figure, cotton growers this year may sell 10,000,000 pounds of cotton to the rubber industry for the tractor tires and other wheeled farm implements alone.

Especially interesting to cotton growers is the fact that the rubber industry will take the production of nearly two million acres of cotton this year. The remarkable growth of motor transportation indicates that the rubber industry will become a cotton customer of even greater importance in the future. And, in addition, new applications for rubber will add considerably to that industry's consumption of cotton.

CO_2 in Storage and Transportation of Fruit

Condensed from Pacific Rural Press

F. W. Allen

Associate Pomologist, California Agricultural Experiment Station

FROM the time fruit is formed on the tree or vine until it is harvested certain physical and chemical changes which both build up and tear down its tissues are in progress. Through minute openings in the skin the fruit is continuously taking in oxygen from the air and giving off carbon dioxide. It is carrying on a true process of respiration. After removal from the tree this respiration process continues at a more rapid rate, and likewise there is a continuation of most of the chemical changes involving transformations in starch, sugars, acids and pectin materials. Now, however, since the source of food supply has been removed these changes are wholly destructive in nature, and the tissue of the fruit is constantly being broken down and utilized through the process of respiration. The fruit rapidly becomes ripe or over-ripe (depending upon the nature of the fruit and its maturity when picked) and is soon ready to be discarded.

A low temperature, such as is usually maintained in cold storage rooms, is the most effective and practical means of retarding ripening processes. Emphasis should be placed upon the word "retarding," as to stop the processes entirely necessitates freezing. Freezing kills the cells and changes the texture of the fruit so that it is no longer in its original fresh condition. Fruits, however, have a freezing point usually 2 or 3 degrees below that of water so that they may safely be held at 32 degrees, and in some instances several degrees lower, where ripening is at the minimum and where in most instances storage life is at the maximum. Certain fruits and certain varieties of fruits, as well as some vegetables are subject to several types of low temperature injury, even when held above freezing temperatures. Bananas chill and fail to ripen properly if transported or held below 50 degrees F. Likewise, lemons are frequently subject to serious spotting and pitting of the rind. Certain varieties of apples at the ordinary temperature of 32 degrees develop various types of discoloration and break-

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down of their tissues. Tomatoes are likewise subject to breakdown injury or to abnormal ripening when held below 40 degrees F.

These and other types of low temperature injuries have brought about the use of temperatures considerably above freezing, but in thus avoiding these injuries considerable sacrifice is usually made in the maximum storage life of the product. Under usual storage conditions ripening of deciduous fruits is nearly twice as rapid at 36 degrees as at 31-32 degrees and at 43 degrees the rate is approximately four times that at 31-32 degrees. This more rapid rate in ripening naturally means corresponding reduction in storage life. If, however, we "condition" or change the normal storage atmosphere either by adding carbon dioxide or by reducing oxygen (usually both), it is possible not only to avoid this increase in rate of ripening but actually to retard it below that which normally occurs in air at approximately freezing temperature. Thus artificial atmospheres offer rather important possibilities as an adjunct or supplement to refrigeration.

The action of carbon dioxide upon the metabolic activities of the fruit has been known for a long time. But not until Kidd and West, two English investigators, published their results on holding apples in artificial atmospheres about twenty years ago was there any interest in its commercial possibilities. These investigators were the first to point out low temperature injury in English grown apples, and the fact that this injury could be avoided without excess ripening of the fruit by holding it in an atmosphere of 8-10 per cent carbon dioxide with a corresponding reduction in the percentage of oxygen. As a result of their investigations, it is reported that England now has over 200 storage houses in which there are some facilities for holding fruit in artificial atmospheres. In this respect, we, in this country, are a little further advanced than was England twenty years ago. So far as known, no commercial storages exist, and, while various investigators had previously reported the effect of carbon dioxide atmospheres upon fruit ripening and its possibilities for retarding ripening and spoilage in transit, little if any experimental work looking toward the commercial possibilities of gas storage was reported in the United States prior to the work inaugurated at the California Experiment Station in 1933. Since that time considerable experimental work has been done and a number of reports have been issued.

Chief attention at this station has been given to the storage of Yellow Newtown apples, as

grown in the Pajaro Valley, where, on account of the susceptibility of the fruit to the discoloration of the flesh known as internal browning, it is already commercial practice to store it at a temperature of 36-38 degrees. The general results from our tests with apples have definitely shown the effects of artificial atmosphere in retarding both coloring and softening of the fruit at a storage temperature as high as 45 degrees. In most instances apples held at temperatures of 40-42 degrees have remained entirely free from browning and have in all instances been firmer and have shown less color development than comparable samples held under normal conditions at 36 degrees. In fact, the fruit at 40 degrees F. in gas has had an external appearance and firmness equal to that stored at 32 degrees in air, where usually after a few months' holding it is rendered useless on account of severe browning.

During the season of 1938-39, in cooperation with one of the large storage houses in Pajaro Valley, probably the first attempt was made on a commercial scale to store apples under gas conditions when 15 thousand boxes were placed in a room which remained unventilated until near the end of the storage season. Owing to inability to maintain a concentration of carbon dioxide above the general level of about 7 per cent the results were slightly less marked than those carried on in the experimental storage at Davis, but on the whole it was found that the fruit held in this room at a temperature of 40-42 degrees without the development of any browning was equal to that held at 36 degrees in air where a considerable amount of slight browning developed late in the season.

Tests similar to those conducted with apples have been carried out with several varieties of pears and to a limited extent with cherries, apricots, plums and peaches. Although it is not recognized that these fruits are subject to low temperature injury, carbon dioxide has definitely retarded their ripening and at least with pears appears to have definite possibilities in extending their normal storage life.

English investigators have already reported that they are able to extend the life of Bartlett pears at 31 degrees for 8 to 9 months. The results which have been secured at this station do not indicate quite such a long storage period, although at each of the three temperatures, 31, 36 and 45 degrees, the normal storage life of Bartlett pears was practically doubled by holding the fruit in atmospheres containing 5 to 10 per cent carbon dioxide and a 10 to 15 per cent reduction in

oxygen. Some of the fruit held at 31 degrees F. had a good appearance even after 4 to 6 months, but the dessert quality was materially reduced.

In experimental storage trials it is possible through the use of compressed gas in cylinders, to subject different lots of fruit to different proportions of carbon dioxide and oxygen. In combination with controlled ventilation, dry ice may also be used as a source of carbon dioxide. In commercial storage houses the usual method of securing the carbon dioxide is simply to store the fruit in a tight room and allow it to build up through respiration of the fruit. When it reaches the desired concentration (usually about 10 per cent) this can be maintained at a fairly constant level by means of ventilation. In the process of respiration approximately one part of carbon dioxide is given off for each part of oxygen used. Thus in a room containing 10 per cent carbon dioxide the oxygen is usually reduced by the same amount of oxygen. This proportion of carbon dioxide and oxygen, while perhaps not the most effective, is the easiest one to maintain and has proven quite satisfactory for both Yellow Newtown and Yellow Bellflower apples. What appears to be a somewhat better proportion would be a 5 to 10 per cent concentration of carbon dioxide with only 2½ to 5 per cent oxygen. These concentrations are also possible in commercial storage houses but necessitate the installation of certain absorbing materials to remove the excess oxygen. Additional storage trials are being made to work out the optimum conditions for different fruits and for different varieties.

The difficulty experienced in holding the desired concentration of carbon dioxide in storage rooms has been mentioned. The gas is an exceedingly active one and, although large quantities of fruit are constantly giving it off to the atmosphere, it is necessary to have gas storage rooms as nearly air tight as possible. The method previously employed in England has been to line the room with sheet metal and cover the overlapping edges with some such sealing material as vaseline. More recent methods which have been tried are those of treating the walls and floors with different types of fillers and paints which will prevent their absorption of the gas. Special type doors are usually also necessary to prevent leakage.

Perhaps it is obvious that in gas storage rooms all of the fruit must go into the room at one time after which it is sealed up and is not entered until late in the storage season when probably all of the fruit will be removed at once. Openings through the walls are

usually provided for securing samples of air within the room so as to determine when ventilation is necessary. In case of emergency one can, of course, go into such storage rooms, but if the concentration of carbon dioxide is much above 5 per cent an oxygen mask will be necessary.

The influence of carbon dioxide in retarding coloring and softening of fruit at relatively high holding temperatures opens a second field for its use—that of supplementing ice refrigeration in the transit of fruit to eastern markets.

Previous to the general practice of precooling, losses from fruit arriving in an overripe condition in the top of refrigerated car loads were frequently high, and even at best much of this fruit was sold at a discount. Precooling has done much to alleviate and to avoid this loss but even in well precooled loads top temperatures of 40 to 45 degrees F. are to be expected in transit, and as previously stated fruit at this temperature ripens several times faster than it does at 32 degrees F.

During the past several seasons, as a part of our storage investigations, cherries, plums, peaches and pears have been held in various concentrations of carbon dioxide for a 10-day period at temperatures of 45 and as high as 65 degrees F. Space does not permit giving detailed results of these individual tests, but on the average the fruit held for 10 days in carbon dioxide at 45 degrees F. was no more, if as much, advanced in maturity as comparable samples held in air at 32 degrees F.

Beauty plums, which, after 10 days at 45 degrees in air, were light to medium red in color and firm ripe to ripe, were, when held in 10 per cent carbon dioxide and 19 per cent oxygen, greenish yellow to yellow with only ¼ to ½ the surface showing a light color. Two to three days were required for such fruit to reach prime eating condition.

In experimental shipping tests carbon dioxide may be supplied either from cylinders or from dry ice. In commercial practice dry ice is used and, as this sublimes, the gas is given off. This dry ice has, in some instances, been put in the car bunkers with the water ice, but placing it near the center of the car over the load of fruit appears preferable.

Not only does carbon dioxide retard ripening at high temperatures but it also has the effect of retarding, and in high concentrations even preventing, various mold growth and rots such as Rhizopus, Botrytis, and Monilia which are frequently serious on the more perishable fruits.

The uses of carbon dioxide or dry ice for the shipment of fruits in carload quantities is still in the experimental stage and along

with its valuable possibilities several limitations should be stressed.

First, even more than in storage rooms, the leakage of gas from the average refrigerator car, especially when rolling, is large. At least one reicing with dry ice during a full 10-day transit may be necessary for best results.

Second, the tolerances of each kind of fruit for the gas must be determined. Brooks reports that berries, apricots, and peaches may be injured by a 20 to 25 per cent concentration after 24 hours, but that other fruits may be subjected to higher concentrations and for longer times. In our own tests under shipping conditions cherries, plums, pears, and apples have successfully withstood concentrations of 40 to 60 per cent carbon dioxide with little or no injury.

Carbon dioxide injury usually first manifests itself in a loss of aroma and flavor of the fruit. If the concentration used is sufficiently high there may be an actual carbon dioxide taste, which, however, usually disappears after removal of the fruit to the air.

Shipping trials which have been carried on by Brooks and others on vegetables show that peas, carrots, and sweet corn held in carbon dioxide arrive in a much fresher condition and sweeter in taste than similar lots at the same temperature in normal air. Preliminary trials conducted the past season at Davis with asparagus gave very promising results. During the 10-day holding period no mold appeared on any of the lots including those stored in air. The air stored samples, however, did show considerable growth and a tendency for the heads to blossom out, whereas growth was definitely stopped in the samples held in carbon dioxide. Cooking tests failed to reveal any "off" flavors from the lots held in gas.

In conclusion, it might be stated that although carbon dioxide offers important possibilities in both the storage and transportation of fruits and vegetables it is capable of doing considerable damage, and that it should not be used indiscriminately.

Two Dollars Capital

Condensed from Pennsylvania Farmer

IN the fall of 1923 a Russian farmer with wife, two-year-old child, $2 in cash and no knowledge of the English language got off the train at Lancaster, Pennsylvania. Today he owns a good Lancaster county farm, is regarded as one of the best tobacco growers in the county, has the respect of his neighbors, and a deep-rooted conviction that opportunities in farming in Pennsylvania are not extinct.

Alexander Frederick Stadel was born on a farm in Crimea, southern Russia—the "garden spot" of that country. His grandparents emigrated from Germany and thus his heritage was love of good land and skill in its culture. Four years in the army of Nicholas II, ill-fated Czar, convinced him that Europe would always have wars; that opportunity lay elsewhere, the farther away the better. He determined to come to America and in preparation read everything about this country he could get his hands on. He became better informed about conditions in different parts of the United States than are most of its citizens. His information led him to select either California or Lancaster county, Pennsylvania.

Following the Russian revolution and with the establishment of the Kerensky regime Mr. Stadel saw his opportunity to depart from the land of his birth.

Mr. and Mrs. Stadel got as far as Turkey, where a daughter was born to them. When she was two years old they resumed their journey, taking third class passage for New York. Reaching Ellis Island they found their passports all right and being within the quota from Russia they were permitted to enter the United States. But what about the baby? She was born in Turkey, hence a Turkish citizen. She had no passport, and anyway the quota from Turkey was full. She could not enter this country but must return to her native land. In the few hours at their disposal nothing could be done, so the family was bundled on the same boat and shipped back to Turkey.

Meanwhile the Y. M. C. A. in New York had heard of this strange situation and got it straightened out at Washington. Three days out from New York a wireless telegram arrived for Mr. Stadel. It was in English and he could not read it. He knew Russian, German and Turkish but no English. Eventually he

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located a Turk who found another Turk who could speak Greek. The ship's purser could not speak Turkish but understood Greek. Thus the telegram was deciphered. It gave the Stadels full permission to enter the United States. But boats don't drop passengers in mid-ocean and the trio without a country went on to Constantinople. They then took the next boat for New York, arriving at Ellis Island 90 days after they left Turkey the first time.

They had $13, not enough for fare to California but enough to get them to Lancaster. Here through a man whose name they had got from Mennonite friends Mr. Stadel landed a job on a farm, husking corn. He started also to learn the English language. The first words he learned were "Gee" and "Haw"—in driving mules. He worked for the first farmer two months, for another a year and more, saving his money and earning a reputation for energy and reliability. A run-down farm of 77 acres near Lititz came up for sale. He bought it and of it the Stadel family have made a farm to which other Lancaster county farmers point with pride.

Today this once neglected farm has a tile silo 55 feet tall, built by the owner, other buildings repaired or remodeled, a teeming garden laid out with the eye of the artist and tended with "growing hands." It has four acres of as fine tobacco as one will find in the county, four acres of tomatoes which promise to equal last year's yield of 14 tons per acre, 17 acres in corn for grain and silo, four acres in well-cared-for potatoes. Eleven acres of wheat averaged 35 bushels per acre this year; four and a half acres of barley averaged 30 bushels. It is a prosperous diversified Pennsylvania farm with adequate equipment, a definite system of soil improvement and self-reliant ownership.

Asked for their first impressions of this country Mr. Stadel replied that it was unfavorable. On the train ride from New York to Lancaster Mrs. Stadel seeing farm homes far apart thought the life must be lonesome and dreary, for in her country farmers lived grouped in villages, going miles each day to work their distant land. But they have got used to the American way and life is not lonely for them.

The element of luck is not lacking in this saga of the Stadels, but it is not the kind of luck most commonly courted. Here there is no heritage of wealth or name or favored nationality, but a native gift of gumption, a wealth of physical endurance and mental fortitude; a cheerful but firm determination to proceed regardless of obstacles. We find no lamenta-

tions over hardships or wasted years or lack of opportunity. There is luck perhaps in being so consitituted that one can save a little money; there is luck in not meeting tragedy or unavoidable calamity. In these things certainly the Stadels have been lucky, but primarily their ability to do what many in high office have said could not be done—the buying and paying for a farm from the produce thereof—is due to hard and intelligent work, to self-sacrifice and to unwavering faith in the soundness of American agriculture.

Great White Herons Making Comeback

THE great white heron, majestic bird of Florida that was almost wiped out in the 1910's by hunters who sold its plumes to milliners, is well on its way to successful recovery, officials of the Fish and Wildlife Service report. According to a recent estimate there are about 1,000 of these birds on the Great White Heron and Key West National Wildlife Refuges on the Florida Keys. Others may be found on other keys in the Gulf of Mexico.

Established in 1938 as a sanctuary for these comparatively rare birds, the Great White Heron Refuge consists of a number of keys and islands lying along the Gulf of Mexico side of the main Florida Keys. The 2,000-acre refuge was established primarily to preserve the great white heron but, with its adjacent sister sanctuary, the Key West National Wildlife Refuge, it also protects other forms of wildlife, including many species of herons, the man-o'-war bird, eastern brown pelican, snowy egret, white-crowned pigeon, turkey vulture, southern bald eagle, laughing gull, and terns. —*Armour*

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Rye Grass as a Soil Builder

Condensed from New Jersey Agriculture

H. R. Cox

Extension Agronomist

RYE grass is beginning to be recognized as one of our most useful winter cover crops on soils which are not too light or sandy. It will tolerate earlier seeding than rye or wheat, both of which usually show a great deal of rust if seeded during the summer. Sown any time between July 1 and October 1, rye grass, the fastest growing of all the grasses, may be expected on good land to make a dense sod over winter. The seed cost is low, about the same per acre as for rye or wheat, and if the seed is not covered too deeply it is as sure to make a stand as rye or wheat.

Farmers who have sown rye grass have been much impressed with the abundant mass of roots and tops produced during the over-winter period. Comparative measurements made in Cumberland County several years ago indicated that rye grass made from 50 to 100 per cent more dry matter than either rye or wheat.

It is not anticipated that rye grass will be substituted to any extent for such valuable leguminous cover crops as hairy vetch and crimson clover, which have the great advantage of accumulating nitrogen on their roots and leaving it in the soil. The principal place for rye grass seems to be as an alternative to rye or wheat, particularly for summer seeding.

There are several kinds of rye grass. Perennial rye grass, the seed of which is usually too high in price for cover cropping purposes, is used extensively in grass seed mixtures for permanent pastures and lawns. Italian rye grass, which is largely imported, functions principally as a winter annual and is entirely suitable as a cover crop. The domestic rye grass is a mixture of types, annual and perennial, the seed of which is produced largely on the West Coast. To date there seems to be little difference between the domestic and Italian for cover cropping purposes, so that choice may best be determined by relative cost.

If correct seeding methods are followed 20 pounds of rye grass seed to the acre is ample. On a

Reprinted by permission from New Jersey Agriculture, New Brunswick, N. J., July-August, 1940

well prepared seedbed with a fair supply of residual plant nutrients it is probable that 15 pounds per acre would be sufficient, assuming the seed is not covered too deeply.

Rye grass may be sown in a standing, cultivated crop, either just before or immediately after the last cultivation. Sowing just before is probably preferable on the lighter soils. In sowing just after the last working the next good rain usually covers the seed sufficiently with loose soil.

On open land, after the cultivated crop is harvested, seeding may be done by means of a grain drill, delivering the seed from the grain hopper. The main objection to the grain drill is that it may bury the seed too deeply, especially on heavy land. To meet this objection some growers intend this year to lift the tubes from the grain hopper free from the boots so that the seed will fall on the surface behind the drill, then being lightly covered with chains dragged behind the drill. If the grower does not have a grain drill he may scatter the seed by hand or with a cyclone sower, then cover with a weeder or spike harrow.

Under the direction of County Agent D. M. Babbitt, Hunterton County, N. J., tests have been carried on for the last three years to determine the best kind of cover crop to establish in standing field corn. Rye grass has shown itself to be the best of all. Not only has it been most effective in preventing soil erosion and in taking up and holding nutrients for the benefit of the succeeding crop, but it has shown itself capable of furnishing a considerable amount of late fall and early spring pasture.

Rye grass as a cover crop mixes well with hairy vetch and clover. A mixture of 10 pounds each of rye grass and crimson clover for August seeding or 10 pounds of rye grass and 15 pounds of hairy vetch for August or September seeding seems to be satisfactory.

A Young Industry Gains Strength

Condensed from Nation's Business

O. A. Fitzgerald

WHEN a Colorado strawberry jam-maker, H. A. Baker, 32 years ago hit upon the idea of freezing fresh berries to take the rush out of the jam-making season, he really started something, the full significance of which we are just beginning to witness.

Ordinarily the jam-makers worked day and night during the short fruit season; then everything stopped. That was the only way the pack could be made. Baker wondered if there wasn't some way to spread the job over a longer period. There was little chance to alter the ripening habits of the berry plants, but what about freezing the ripe berries and holding them in cold storage until they were needed? He began to put berries in 50-gallon barrels, sugared them heavily and turned them into ice crystals. Soon all jam-makers were freezing berries so they, too, could make their jam in a more leisurely way.

Others with vision saw the implications of what the jam-makers were doing. If berries can be frozen and held in storage and later made into jam just like fresh ones, why can't frozen berries be taken directly to the consumer? Housewives soon were thawing out in December and January small packages of berries which had been frozen since June.

One thing led to another, as it always does when the vision and technical ability of American industry see an opportunity. The possibilities of preserving other fruits and vegetables in the frozen form began to attract attention.

The housewife in practically every city can buy frozen fruits or vegetables from her local food dealer. In the larger ones she can get them from delivery trucks at her door. Altogether, about 20 frozen vegetables and 25 frozen fruits are on the market commercially. Frozen fruit juices and purees are beginning to appear. Research steadily is attacking obstacles that stand in the way of freezing items not now on the market. A story all by itself is the big frozen meat and fish field, but here we are concerned only with what comes from the garden, the berry patch, and the orchard.

Into the sub-zero hold of Admiral Byrd's flagship went a large supply of frozen foods last November. In Little America members of the Byrd party are

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eating asparagus, whole green beans, Golden Bantam corn, peas, spinach, lima beans, strawberries, blueberries, blackberries, and raw shrimp, which were frozen in the United States. Airliners, ocean liners, and streamline trains have become steady customers. Every Pan-American Clipper starting westward from San Francisco carries ready-cooked frozen meals, even to frozen soups and roasts. All they need is warming up.

In 1925, the nation's frozen pack was about 12,500,000 pounds, practically all strawberries, frozen by or for jam-makers. Vegetable freezing began to appear in 1930-31, but development was slow and in 1933 the pack was only about 2,500,000 pounds, mostly peas.

In 1938 the frozen fruit and vegetable volume had climbed to more than 200,000,000 pounds. Of this, about 85,000,000 pounds was vegetables and 118,000,000 pounds was fruits. That pack exceeded the one of the year before by better than 10,000,000 pounds.

Peas rank first among the vegetables with 34,000,000 pounds and lima beans come next with 19,000,000 pounds. In the Pacific Northwest you see pea fields of hundreds of acres growing a crop expressly for freezing. In New Jersey, one freezing company plants about 12,000 acres to lima beans. Other vegetables frozen in large quantities include asparagus, snap beans, cut corn, corn-on-the-cob, broccoli, Brussels sprouts, carrots, cauliflower, spinach, squash, rhubarb, and mushrooms.

Strawberries still account for the biggest part of the frozen fruit tonnage. Blueberries are second and cherries third. Other main fruits are raspberries, loganberries, blackberries, currants, gooseberries, huckleberries, prunes, peaches, apricots, youngberries and cantaloupes.

Women's magazines are beginning to give frozen foods major attention, a sign that they have clicked in the homes. Special recipe books are appearing, because these foods require special handling in the kitchen. The first advertisement of frozen fruits and vegetables in a general magazine appeared in 1939. Seed catalogs are starting to designate the varieties of fruits and vegetables most adaptable to freezing for the guidance of home gardeners who do their own freezing in locker boxes.

In the large cities, the larger department stores are pushing frozen foods energetically. Door-to-door delivery service is here; in some cities fleets of refrigerated trucks deal mainly in frozen items. The East is trying out the frozen wholemeal idea.

Here is a sample dinner handled by a company in a Philadel-

phia suburb; one pound of filet of sole, one package of asparagus, and one package of peas and corn, with string beans or spinach as alternates. If the housewife doesn't want the ready-made dinner, she has a choice of a complete line of frozen sea foods, meats, poultry, fruits, vegetables, and fruit juices.

Retail sales have increased tremendously in the past two or three years. One of the largest freezers in the East recently reported 1,250 new retail outlets added in 1938, bringing its total to more than 4,000.

In metropolitan New York alone, approximately 650 retailers handle frozen fruits and vegetables. Ten years ago one company in the East had four freezing plants and sent its products out through 12 dealers; now it has 29 plants and sells through nearly 5,000 dealers.

What lies behind this rush to frozen foods?

Horace Campbell, assistant chemist at the Frozen Pack Laboratory of Seattle, where the U. S. Department of Agriculture conducts trail-blazing research in this new method of food handling, explains it like this:

We are forced to acknowledge that, when properly carried out, no other method of food preservation can produce finished products retaining so much of the original natural flavor, color, and odor of the freshly harvested material. Furthermore, it frequently happens that frozen fruits and vegetables are even superior in quality to the so-called fresh produce in city markets. This is not difficult to explain when we consider that frozen foods are usually harvested and frozen within a few hours, while from several hours to a few weeks may transpire between the time so-called fresh produce is harvested and the time it reaches the consumer.

Frozen items appeal to the housewife because the quality is uniform; they have excellent eye appeal, and their eating qualities —assuming they have been properly handled in the freezing, in storage, and in the kitchen—rival those of the best fruits and vegetables fresh from the garden. She buys only the edible parts; there is no waste.

Just imagine all the pea pods, asparagus butts, and the fruit and vegetable trimmings that are shipped thousands of miles just to go into the garbage can. The freezing plant removes all the waste and the producer, who usually has some livestock at home, gets it back as feed or as soil-building compost for his land.

In this day of scientific achievement, someone may soon turn those fibrous wastes into building boards, plastics, or chemicals.

Science long has looked upon agricultural wastes as potential

material for great by-product industries. The stumbling block has been they are so widely scattered and seldom available in the concentrated tonnages needed for such industries. Freezing plants may provide some wastes in sufficient quantities to intrigue the waste-utilizers.

Tests by experiment stations indicate that the vitamin content of the standard brands of frozen fruits and vegetables is fully equivalent to that of the better grade of fresh fruits and vegetables sold in the markets. This is because of the speed in freezing. A package of frozen peas bought by a New York housewife actually may be only an hour or two old from a Pacific Northwest pea field several thousand miles away. Frozen foods have gotten a clean bill of health in other ways. No cases of sickness or death have been traced to them.

Behind the spectacular spurt in retail sales lies solution of the refrigerator box problem in stores. When the industry was young and enthusiasm among freezers was high, production swept far ahead of distribution. To handle frozen foods, a dealer must have a refrigerator box which will keep the packages at zero or below until the consumer takes them. In the beginning, such boxes cost $1,200 to $1,800.

Retailers naturally shied at spending so much for equipment until they were sure of their ground. The freezing industry soon saw that the biggest need was to get these refrigerator boxes into service by the thousands. Further illustrating how American ingenuity and technical ability can handle a problem when it becomes urgent, retailers are now getting the refrigerator boxes for $300 to $400.

Without our vast background of achievement in refrigeration, this frozen foods industry would have been impossible. Because of it, we see refrigerator cars and trucks carrying these below-zero groceries anywhere from across town to across the continent. One eastern company has 34 trucks making house-to-house deliveries.

This sort of energetic promotion is winning new consumers. When an ice cream company in Detroit took on frozen fruits and vegetables only two out of 100 customers on one route were using the frozen foods. The driver took samples and soon had 50 customers.

Special cold storage vaults have been added to the Pacific Coast ships serving Alaska to carry frozen packages to the North.

Especially interesting and typical of our ability to do new things is the practice of a Northwest pea freezer. For two days the refrigerator car is iced and the temperature brought down to about ten above zero. Then the

car is rolled alongside the freezing plant and a folding tunnel connects it with the freezing chambers. From the freezing room, 30-below zero air is blown into the car. While this frigid air is circulating, the frozen peas are loaded and the car is quickly sealed and started on its way. When it reaches its destination—Chicago, Boston, New York, Philadelphia—the cargo will still be five or ten degrees below zero.

No region has a monopoly on the freezing industry. The Northwest pioneered but the East followed quickly and, taking full advantage of the large city markets, expanded much more rapidly. Now the West freezes most of the fruits with the East providing more than half the vegetables. Practically every state in between is expanding in the business.

Naturally a development of this magnitude has increased acreages devoted to vegetables and berries for freezing. Most of this increase, however, represents a shift from other crops. In some sections, notably in the West, farmed acreage has actually increased. In the Puget Sound area, for instance, considerable land which has been idle or in pasture now is producing vegetables for freezing. The acreage shift has, in many cases, created more farm labor.

Crops which required less man power have been replaced by those requiring more.

The concern of producers in the southern states, who, until now, have had exclusive privileges in the huge winter fresh fruit and vegetable markets of the North, is entirely justified. How big this southern fresh fruit and vegetable business has grown is apparent from statistics from the U. S. Department of Agriculture. Twenty years ago only 232,000 acres in the nine southern winter-garden states were producing fresh stuff for shipment. Now there are 1,100,000 acres. Today for the first time in history, farmers in the northern states are beginning to compete directly with the fresh produce which comes north every winter.

Forecasting permanence and further expansion is the energy with which freezers and prospective freezers are prospecting all major agricultural areas to find the sections where the highest quality fruits and vegetables for freezing can be grown. The canning industry once did this same kind of investigating to locate superior production areas. Because varieties for canning and the fresh market are not always the best for freezing, all this background testing must be done over. Freezers naturally are looking for the places where the best quality produce can be grown. Freezing adds nothing to the

quality of fruits and vegetables, but it does preserve a high degree of what quality, flavor, juiciness, and color there are in the product. Freezing, therefore, offers excellent opportunities for areas where farmers take pride in producing top quality crops.

Research science again has demonstrated its right to a place at the head of the parade. Freezers are loud in their praise of the work done by Dr. H. C. Diehl and his associates at the Frozen Pack Laboratory of the U. S. Department of Agriculture at Seattle. The industry developed so fast that questions piled in on the technical experts in avalanches. The Seattle laboratory packed thousands of containers of different fruits and vegetables each year to find out how they should be harvested and handled, how they should be packed, and at what temperatures they should be frozen, stored, and distributed.

Co-operating with the state experiment stations of Washington and Oregon and the United States Bureau of Plant Industry, the laboratory helped collect information as to what varieties and types are best suited for freezing so that the growers and freezers have been guided in what to plant, when to plant, and how to grow and harvest the crop. One year the testing involved 150 different varieties of peas. Much is yet to be learned.

As this is written, word comes that the Seattle Laboratory has found a way to prevent discoloration in the freezing of apples. Like many fruits, the apple turns dark a few moments after the cut surface is exposed to the air. This habit has held up apple freezing.

The scientists found that, if the apple slices get a quick bath in steam before being frozen, they remain tender and do not discolor. When this method reaches commercial production, bakers and housewives will have the makings of fresh apple pie all the time. More apple pies may be a factor in checking the widespread pulling of apple orchards because of poor markets.

Freezing has thrown the fruit and vegetable breeding and testing field wide open. Varieties popular in the past often are not the best for freezing. The tender and juicy varieties of fruits that cannot be shipped are ideal for freezing. The experimental program involved testing all varieties, new and old, for adaptability to freezing.

Last year the Utah experiment station froze 400 different lots of more than 200 different tree and berry fruits. All the seed companies and the experiment stations have told their plant breeders to develop new varieties expressly for freezing.

No longer can we sidestep the question which probably has been

ing affect the canning industry? reader all along: How will freezing effect the canning industry? Obviously this is much easier to ask than to answer. Ten years from now the question probably will have answered itself.

Although freezing has had amazing growth, the canning business has felt no decline due to this new competition. The expansion in crop acreage for freezing has not been at the expense of the canning crops. Reports from most sections say that acreage of canning crops has been increasing, too.

When freezing first appeared, canners generally were alarmed. This was a natural reaction even if it was erroneous, because the canner really was the logical individual to pioneer this new kind of food processing. As the men at the Seattle laboratory point out, the fundamentals of canning and freezing are essentially the same, except that, in one case, processing is accomplished by high temperatures and in the other at below-freezing temperatures. Soon many canners began freezing. The food handling experiences of the canner have proved invaluable in the development of the freezing industry.

Right now the major competition appears to be with out-of-season produce. Of course, one must admit that, if the great mass of our people acquire the desire for and can obtain frozen foods, they may eat less canned foods. The ultimate answer will come from the large-scale retail outlets which are just beginning to open in a way which means volume. The small-package household market offers greatest possibilities and obviously holds the answer. If consumption of frozen items continues to increase at the rate of the past few years, repercussions are bound to be felt somewhere in the food industry. Right now freezers are cutting in on canning in the hotel and restaurant trade. Large containers of frozen peas are beginning to replace canned peas. The volume is not large but it may be a barometer.

Whatever may be the ultimate relationship of canning and freezing, this new method of food preservation is here to stay.

The Use of Fertilizers in Soil Conservation

Condensed from Better Crops With Plant Food

H. H. Bennett

Chief, Soil Conservation Service, U. S. Department of Agriculture, Washington, D. C.

WHAT is the relationship between soil fertility and soil erosion? Is fertile soil more or less susceptible to erosion than non-fertile soil? Does fertility affect the rate or amount of soil loss by erosion? What effect does it have on surface water runoff? Does the use of commercial fertilizers speed up or retard the erosion process? Is it worthwhile to apply fertilizers on fields subject to erosion? Should the use of commercial fertilizers be included in plans for soil conservation? In recent years, the Soil Conservation Service of the U. S. Department of Agriculture has found answers, or at least partial answers, to most of these questions. And largely as a result of research by this agency, it is now generally recognized that soil fertility is one of the first essentials of effective soil conservation.

At its Bethany, Missouri, experiment station, for example, the Soil Conservation Service found that the use of commercial fertilizers in a corn, small grain, clover-grass rotation resulted in a marked decrease in soil loss from erosion.

These results covering a 4-year period (1931-1934 inclusive) of experimentation at Bethany, Missouri, showed that by applying three tons of ground limestone and 200 pounds of 20% superphosphate to wheat in a 3-year rotation (Plot 6, Experiment 1), the soil loss was reduced by 49% and the water loss as runoff by 26.1% of those losses recorded for the adjoining area of topsoil (Plot 5, Experiment 1), which was not fertilized or limed.

The soil and water losses from the untreated Shelby topsoil cropped to two years of clover and timothy followed by a crop of corn (Plot 1, Experiment 2) were only 48.55%, which was 73.28% as large as the losses recorded for Plot 2, Experiment 2, representing the untreated exposed subsoil similarly cropped. By treating the exposed subsoil with three tons of finely ground limestone and 250 pounds per acre of 4-12-4 fertilizer (Plot 3, Experiment 2)

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before oats, the soil loss for the two years in meadow and one year in corn was reduced to 39.65%, and the water loss to 46.49% of the losses recorded for the unfertilized and unlimed subsoil.

An adjacent area, with topsoil intact, was treated with eight tons of manure per acre, together with the return of crop residues and an addition of 200 pounds of 20% superphosphate and three tons of ground limestone. The average annual losses from this area were 3.74 tons per acre. Where fertilizer and lime were applied to the topsoil, but the crop residues removed and no manure added, the soil loss per acre was 7.79 tons, more than double the loss on the other area.

At the Tyler, Texas, soil and water conservation experiment station, the average annual soil loss from Kirvin fine sandy loam cropped to cotton (where surface soil remained, but no fertilizer used) was 19.08 tons per acre. On the adjoining area, where 400 pounds of 4-8-4 fertilizer were applied, the soil loss was 17.95 tons per acre. Unfertilized subsoil, similarly cropped, lost soil at the rate of 65.29 tons per acre, along with 9.92 inches of rain water. The addition of 400 pounds of 4-8-4 fertilizer reduced the soil loss only slightly. But when a winter cover crop was used along with the same quantity of fertilizer, the annual soil loss was reduced to 48.94 tons per acre. These experiments covered a period of four years, 1931 to 1934, inclusive.

The subsoil of some types of land is more productive relatively than that of other types. But in practically all cases, the exposed subsoil is less productive than the surface soil that once covered it. In like manner, while the subsoil responds to fertilizer applications, the results are much more economical when applied to the topsoil.

Cotton yields produced by an application of 400 pounds of 4-8-4 fertilizer on two areas of Kirvin fine sandy loam (one with a cover of topsoil and the other with the subsoil exposed), near Tyler in eastern Texas, showed comparable results to those secured at Bethany. The average per acre yield of seed cotton for the period of 1931 to 1934 was increased on the exposed subsoil from 50 to 206 pounds by the application of the complete fertilizer, while for the topsoil the increase was from 365 to 580 pounds. Although the average per acre yield was markedly increased by the application of fertilizer in both instances, it will be noted that the average yield for the exposed subsoil, even after receiving a complete fertilizer, was still 43% less than the yield from the unfertilized topsoil. The

application of 400 pounds of 4-8-4 fertilizer per acre to the Nacogdoches fine sandy loam in eastern Texas, where the subsoil was exposed, gave a yield of seed cotton which was 71% below the yield secured when the same treatment was applied to the topsoil of the same soil type.

When cotton was grown at Statesville, North Carolina, on Cecil sandy loam, one of the most important soils of the Southern Piedmont, the yield from the subsoil to which was added a complete fertilizer was 20% below that from the corresponding unfertilized topsoil.

In the Southeast where kudzu is proving to be one of the best erosion control plants, the value of fertilizer, particularly superphosphate, has been well demonstrated. Extensive trials conducted in 1938 on 41 plantings of kudzu on varying soil types showed conclusively that kudzu responded to phosphate on all soils included in the trial. In every case, there was a marked increase in growth where fertilizer was applied, and the heavier applications produced correspondingly greater growth.

These increases in crop yields, along with the reduction in soil and water losses which have resulted when fertilizers were used (on either topsoil or subsoil) in combination with other soil conservation practices, point out the importance of commercial fertilizers in erosion control and soil conservation. The findings on soil conservation experiment stations, together with extensive field observations throughout the country, show the urgent need for initiating soil conservation measures, including fertilizer applications, before the topsoil is removed and the less fertile subsoil exposed. While the productivity level of erosion-exposed subsoils can be raised very materially through the use of fertilizer, manure, green manure, and crop rotations, it is obvious that these same measures, when applied to land where the topsoil remains, insure more complete erosion control and give much higher economic returns. This helps to secure a vigorous growth of protective vegetation. Satisfactory results from the standpoint of yields, as well as soil conservation, cannot be obtained without first ameliorating any existing plant food deficiencies.

Density and character of the vegetative cover on the land, maintenance of a good supply of organic matter, plus a favorable granular soil structure, are among the most important fundamentals in prevention of soil losses by erosion. These factors are closely related to each other, as well as to the productivity of the soil.

Except for excessively sandy land, most virgin soils contain a

fair to good supply of plant nutrients. Consequently, virgin soils produce good crops when other conditions are favorable. Present problems of soil fertility are due to the fact that continuous cropping, particularly to clean-tilled crops, has accelerated erosion on millions of acres. The inevitable result has been that productive topsoil was washed away, leaving a much less productive subsoil exposed. These same acres under different treatment might show no erosion at all, or at least would have suffered to a lesser degree. For instance, a good cover of grass, clover, or other dense-growing vegetation, as well as good forest cover, is highly effective in checking erosion. The appearance of subsoil in a field is not the yardstick by which decreased fertility, due to erosion, is measured. Long before subsoil appears, declining productivity reflected in reduced yields and lowered feeding value of crops are danger flags serving notice that erosion is speeding up.

It is, of course, impractical to devote all land to such protective vegetation. But suitable crop rotations, supported by adaptable fertilizers when needed, along with other proved soil conservation measures, do make it possible to safeguard vast areas of cultivated land from the ravages of erosion.

Large-scale field operations by the Soil Conservation Service, involving millions of acres, have substantiated the vital role of soil fertility in soil conservation. Fertility must be maintained at the highest practicable level, if erosion is to be checked permanently.

What Makes Value in Seed Potatoes

Condensed from Eastern States Cooperator

K. E. Paine

EVERY crop grower knows that one factor having a marked effect on the crop he harvests is the quality of the seed he plants. With many crops, inheritance is one of the most important factors that affect performance of the seed. As potatoes are grown from vegetative cuttings (tubers or tuber pieces) and not from true seed resulting from the pollination of blossoms, the factor of inheritance in any given variety does not change from year to year and is of little practical importance in potato seed.

What, then, are the factors that determine the value of seed potatoes?

Without doubt, one of the most important of these is the presence or absence of tuber-borne diseases, which in one way or another reduce the stand, lower the yield or injure the quality of the crop produced.

The organisms causing some of these diseases may be carried on the outside surface of the tubers, while the agents causing other diseases are carried within the tuber. Scab, Rhizoctonia, and Black Leg are diseases of the first type and can be controlled as far as the seed is concerned, by proper seed treatment. The organisms causing these diseases may also be present in the soil of the field and may cause disease even though the seed is treated or otherwise "clean." The likelihood of heavy infection of these diseases is much lessened by seed treatment, however.

The most important diseases carried within the tubers are Leaf Roll, Mosaic, Spindle Tuber, and Yellow Dwarf. They cannot be controlled by seed treatment, but only by prevention and elimination in seed production. As they may reduce yields all the way from 20 percent to 100 percent in the plants affected, or materially damage appearance and quality, their absence from seed used in potato production is of the greatest concern to potato growers.

To get seed potatoes as nearly 100 percent free from diseases as is humanly possible, a four-step program of production has been developed by the Eastern States Co-operative which now precedes each year's distribution of seed potatoes to members.

The first step in this program is the selection from specially

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grown and selected fields in isolated areas of Aroostook county, Maine, of about 16,000 single-stalk hills which appear healthy and vigorous in every respect. Single-stalk hills are used because they accurately identify all the tubers connected to ONE plant. The production from each hill is placed in a small numbered cotton bag and carefully stored over winter while it is being "indexed" in Florida. This indexing is for the purpose of definitely determining the health of each hill unit. It is accomplished by taking one tuber from each of the 16,000 units to Florida and there growing them during the winter months and carefully recording any disease that appears. The whole hill unit from which a tuber showing disease comes is then discarded the following spring and not planted in the production of *Eastern States foundation seed.*

The second step is the production of this foundation seed. At the present time four growers in isolated areas in Maine have been chosen to carry on this work. They are supplied with the indexed seed described above which they plant by hand in tuber-hill units. A total of 21 acres was so planted in 1940. The plots so planted are rogued severely throughout the season. If a diseased or even suspicious plant is observed, it and the whole unit of which it is a part is immediately pulled up and removed from the field. This, together with thorough spraying and all other good cultural practices, results in foundation seed of highest obtainable quality.

After again carefully storing over winter, this foundation seed is multiplied to make *Eastern States stock seed,* which is the third step in the process of producing *Eastern States Seed Potatoes.* The same four growers carry on this step, but in different fields than the production of the foundation seed. They use specially-equipped planters with assisted feed and spacer attachments to plant this production in tuber units (all pieces of a particular tuber one after another in the row).

In 1940, 165 acres were planted in this step. These are also carefully rogued and the most exacting cultural practices carried out. If a diseased plant is found, it and all other plants which came from the same seed tuber are pulled up, placed in a bag and taken out of the field and destroyed. The production from this acreage constitutes *Eastern States stock seed,* which is the beginning of step four in the program.

In 1940, 13 growers in northern Maine are co-operating in the fourth step, comprising 965 acres of six varieties. They dispose of all their previous year's production

and thoroughly disinfect and fumigate their equipment, storages and other facilities. This operation is an insurance measure against the development of the dread disease of Bacterial Ring Rot. They are then supplied with stock seed produced by the growers in step three, and under the best of cultural practices, including cover crops to maintain organic matter, adequate fertilization, seed treatment, thorough cultivation, and spraying or dusting they produce the seed for other Eastern States members to use throughout the territory the following year. This whole program is under the direct supervision of Dr. Carl Koch, plant pathologist and potato specialist, and is entered for inspection and certification by the State of Maine Department of Agriculture.

And so in these four carefully controlled steps taking a full three-year period, seed potatoes are produced as free from seed-borne diseases as present-day knowledge and methods make possible.

In this program, factors other than elimination of disease which make for value in seed are not forgotten or overlooked. Desirable physical condition of the tubers is assured by providing for proper growth and maturity, careful handling with modern equipment, and storage with controlled temperature and humidity.

Members are provided efficient usage by two practical grades according to size. The Premium grade U. S. No. 1 ranges from 1¼ inches to 2 inches in diameter, and tubers in this grade should for the most part be planted whole. By avoiding any cut surface and assuring a dominant eye in every hill, a quicker and more uniform come-up and a better stand and more rapid growth is assured especially in early stages and under unfavorable soil conditions. The Certified grade U. S. No. 1 includes tubers from 2 inches in diameter to 10 ounces in weight. Obviously, these must be cut once or more for efficient planting. Both grades are hand-sorted to eliminate cut, bruised, and offshape tubers, and disqualifications for U. S. No. 1.

Let's Analyze the Confusion About Bloodtesting

Condensed from Hatchery Tribune

Dr. R. T. Renwald

MUCH confusion has arisen in the minds of hatcherymen regarding bloodtesting for pullorum, particularly in the midwestern territory.

On farms where the reaction has run from 3 to 7 percent for the last few years, it has suddenly jumped in some instances to 20 percent and even as high as 70 percent, creating confusion in not only the minds of the testers who have no answers for it, but also in the minds of flockowners. Antigen and the technique of testing seem to be the center of interest, with some people wondering whether it pays to bloodtest at all.

We have a rise and fall in the incidence of other infectious diseases of both man and animals, so why should we not expect it of pullorum. We may say that the rise and fall of a disease is governed by the virulency of the infecting organism and the susceptibility or resistance of the population. What about the population of poultry? For years no testing was done in the middle west, and it was a survival of the resistant that constituted the poultry population. Then testing was begun and done once a year, until eventually there was established a population quite resistant to pullorum and reactions declined to a certain level and did not vary a great deal. *Whenever the susceptibility of a flock rises, we will get an increase in reactions.*

For instance, a certain flock showed 45 percent faint reactions on the first test in the fall, and 60 days later it showed 50 percent typical pullorum reactions and 20 percent faint or doubtful ones. The reactions on this farm had run from 3 percent to 5 percent for several years previous. On investigation, it was found that pullorum susceptible cockerels had been used and they had apparently transmitted their susceptibility to this generation of **pullets.**

Two things are concerned in bloodtesting, namely the antigen and the blood of the fowl. So far

Reprinted by permission from the Hatchery Tribune, Mt. Morris, Ill., September, 1940

little attention has been given to the latter. Antigen is dead pullorum organisms stained purple and suspended in an aqueous solution. When a fowl becomes infected, it builds antibodies in its system which are also present in the blood. These antibodies act upon the pullorum organisms and cause a change in them which is noticed by their tendency to stick to each other. These antibodies are not formed at once, but the quantity of them that are formed is governed by the ability of the fowl to produce them and by the amount of infecting pullorum organisms in the system of the fowl. There are a certain number of pullorum organisms in every drop of antigen that is taken from a bottle and placed on the plate, but the amount of antibodies varies in each drop of blood taken from various fowls.

Those fowls that have been infected long enough, and have the ability to produce large quantities of antibodies and have had enough infecting organisms in their system will have sufficient antibodies to make a quick action on the organisms in the antigen. Those very recently infected who have not yet had time to produce many antibodies, or only slightly infected ones, will not have so great a quantity of antibodies and, therefore, a drop of their blood will not produce such a marked change on the organisms in the antigen as shown in the plate.

A doubtful reactor is a potential hazard and should be removed from the flock. Flocks showing a high percentage of reactors of a doubtful nature should be looked upon with suspicion. It may be caused by a recent pullorum infection in a susceptible flock, by one of the various organisms in the Salmonella group, or other factors. The fact that such flocks are used at times as supply flocks with good success, or even definitely heavily infected pullorum flocks do at times produce liveable chicks, adds confusion to not only the hatcheryman but also the flockowner and causes suspicion regarding the value of bloodtesting.

Let us keep in mind, however, that the average number of infected chicks hatched from eggs of reactors is very small, not exceeding 1 percent, and that chicks coming from reactor parent stock may perhaps have acquired some immunity, as there is some evidence to this effect. It could only be a transient immunity, however, but still be lasting enough to protect them in the early days of their life. They are inherently susceptible chicks because they came from susceptible stock and, although they may live as baby chicks, they may contract the infection at a later date and produce a large percentage of reac-

tors. The practice of using such flocks usually leads to trouble in the end.

For the best interests of the poultry industry and the promotion of the control of pullorum disease, it is well that we bring up-to-date knowledge to the poultrymen and not cling to old ideas.

That pullorum testing is a guarantee of the livability of chicks, or that recovery of pullorum organisms is concrete evidence of the cause of death is misleading in some instances and does much to discredit the test.

Pullorum testing is not the sole solution of chick rearing problems. It must be fortified by good management on the part of the raiser and proper fumigation and sanitation on the part of the hatcheryman. The number of infected chicks hatching from eggs from reactors is very small, perhaps under 1 percent, and we are very fortunate in having a test for this disease that will detect most of the susceptible infected fowls. The test does two things—it detects those fowls that may produce infected chicks or those which may not produce an infected chick, but chicks which are likely to be susceptible and become infected later, even if they are hatched free of infection.

Hatcherymen who test once a year should do it conscientiously and do the best job that is possible, explain the advantages of the test and promote bloodtesting; however, they should be a little careful in trying any blitzkrieg of completely eradicating pullorum in their supply flocks, lest they run into the same trouble that has befallen some breeds and strains of poultry, which have been severely and unjustly criticized. To eradicate pullorum completely from supply flocks only, and sacrifice inherited resistance where the bulk of the chicks go to customers who do not bloodtest, may mean trouble and set testing back many years. *Testing has taken quite a jolt already. But by proper education of both the chick buying public and the flockowners and patiently bringing both together on a pullorum control program will do much to increase the success of testing.*

Rules for Safe Tractor Operation

Reprinted from The Michigan Farmer

WITH the fact in mind that a careful operator is the best insurance against an accident the Farm Safety Committee of the Farm Equipment Institute has compiled the following rules that should be observed by anyone operating a tractor:

1. Be sure the gear shift lever is in neutral before cranking the engine.

2. Always engage the clutch gently, especially when going up a hill or pulling out of a ditch.

3. When driving on highways, or to and from fields, be sure that both wheels are braked simultaneously when making an emergeny stop.

4. Always ride on seat or stand on platform of tractor. Never ride on drawbar of tractor or drawn implement.

5. When tractor is hitched to a stump or heavy load, always hitch to drawbar and never take up the slack of chain with a jerk.

6. Be extra careful when working on hillsides. Watch out for holes or ditches into which a wheel may drop and cause tractor to overturn.

7. Always keep tractor in gear when going down steep stills or grades.

8. Always drive tractor at speeds slow enough to insure safety, especially over rough ground or near ditches.

9. Reduce speed before making a turn or applying brakes. The hazard of overturning the tractor, increases four times when speed is doubled.

10. Always stop power take-off before dismounting from tractor.

11. Never dismount from tractor when it is in motion. Wait until it stops.

12. Never permit persons other than the driver to ride on tractor when it is in operation.

13. Never stand between tractor and drawn implement when hitching. Use an iron hook to handle drawbar.

14. Do not put on or remove belt from belt pulley while the pulley is in motion.

15. Should motor overheat, be careful when refilling radiator.

16. Never refuel tractor while motor is running or extremely hot.

17. When tractor is attached to a power implement be sure that all power line shielding is in place.

Reprinted by permission from the Michigan Farmer, Detroit, Michigan

Phosphate Magic

Condensed from The Nation's Agriculture

IN the present broad program of soil building that is being carried on by the TVA, phosphorus, not nitrogen, is the key. The principle reason for this is that nitrogen can be taken out of the air by legume plants, hence farmers can grow their own. There are 20 million pounds in the air above each square mile of land. But phosphorus is an entirely different story.

Big-scale demonstrations of the importance of phosphorus in the soil are being carried on by the TVA, and the results are most impressive. The phosphate fertilizer used in demonstrations is being produced in the form of triple superphosphate, which contains about 45 percent of $P_2 O_5$, which means two atoms of phosphorus combined with five atoms of oxygen. This is about double the concentration of phosphorus occurring in ordinary acid phosphate. A still stronger concentration is produced in metaphosphate, which carries about 66 percent of $P_2 O_5$. Since fertilizers are heavy goods, the obvious advantage of more concentrated fertilizers is that you get a unit of phosphorus in a much smaller package, which means less freight, lower cost of handling and reduced costs all along the line. Furthermore, it tends to encourage the user to apply more phosphorus to the acre, which is a mighty important factor when you consider that recommended applications of ordinary fertilizer are seldom high enough to permit the replacement of all the phosphorus taken out of the soil by the crop. The vital necessity is to get plant food elements to the farmer at lower cost, and that is the objective of the entire demonstration.

All of the work is basically demonstrational, that is to say, the product is not sold on the market in competition with other fertilizers. The aim is to show the advantages of higher concentrations of plant food in fertilizers. If and when that lesson is thoroughly demonstrated, then it is expected that public demand will cause the fertilizer industry to manufacture fertilizers with higher plant food content, and to popularize their use.

When you follow the phosphorus from the place where Nature deposited it, through the fertilizer plant at Muscle Shoals, to its final disposition on the farm, you begin to appreciate as never before the importance, as a matter of fact the vital necessity of keeping up the phosphorus con-

Reprinted by permisson from The Nation's Agriculture, Chicago, Illinois, October, 1940

tent of the soil. You are in charge of William McKenzie Landess, "Mac" to his friends, of the Agricultural Division of the TVA. He drives you to a farm near U. S. Highway No. 31, south of Columbia, Tennessee, where the phosphate "muck" as it is called, is being taken out of the ground where Nature left it. It looks like dark brown clay, but when you rub a bit of it between your hands, it leaves your hands clean. It is more like sand, and it is being scooped up with a dragline after the overburden of soil and rock has been removed. It is found in pockets, rather than in veins of uniform thickness as coal is found. It is found also in the form of solid rock, in other places.

Nature was good to this section of Tennessee, for the top soil of the area contains the highest percentage of phosphorus of any soil in the United States—as much as 6,000 to 7,000 pounds in an acre of soil to plow depth, which is six or seven times as much as you will find in soils which are poor in this element. Generations of experience have proved that crops from this rich soil are superior for feeding purposes to crops grown on poor soils, and that it produces superior animals when fed. Fat lambs and cattle and clean-limbed horses are grazing on the thick turf that covers a big proportion of the land. The rolling pastures with their grazing flocks and herds, backed up by the majestic hills, the rich valleys, the farmsteads set well back from the road and surrounded by trees and shrubbery and clipped hedges—all these tell you that here, if anywhere, is a farm paradise. The homes are large, well designed, manorial in their appearance. The estates are owned by the families that have owned and farmed them for generations. The owners have no other business; many of them breed horses, with the walking horses and saddle types predominating perhaps. Others have cattle and sheep breeding establishments. The rich soil and the sound, conservative policies of the owners have built a farm economy that is unique, one that yields good returns on extremely high land values. Most of the farms are simply not for sale; to the families that own them they possess values that can not be measured in money.

So you see what a soil rich in phosphorus means to the soil and the people. Besides endowing the top soil of this area with tremendous supplies of phosphorus, Nature left the rich pockets or veins which are being tapped to enrich other soils in far places where Nature was not so bountiful.

Then Mac takes you to the TVA fertilizer plant where the Director of the Department of

Chemical Engineering takes you through the plant explaining how temperatures of 2,800 degrees F. are employed to wrest the precious element of phosphorus from the combination with other elements in which it is held. It emerges in the form of a product containing about 45 percent plant food which after proper aging will be available for the use of crops when applied to the land.

About 92,000 tons of this concentrated fertilizer will be produced in 1940. Let us follow the product through one of the demonstration farms near Huntsville, Alabama.

Milburn Lassiter is the farmer. He has 120 acres, bought in 1935 in a badly rundown condition. He immediately terraced the land, started the use of lime and fertilizer, and adopted a farm management program worked out with him by the County Agent, the local landuse association, and the TVA agronomists.

The land had been so poor that the tenant did not even try to grow corn, and the cotton yield was 200 pounds to the acre. So rapid was the improvement than in 1939 the cotton yielded 375 pounds to the acre, and corn this year looks good for 45 bushels. Cover crops are important in controlling erosion on these rolling lands, and this year no less than 84 acres will go through the winter well protected by such crops, largely vetch and other winter legumes. The phosphate fertilizer supplied by the TVA is used to a large extent on legume crops which seems wise procedure, inasmuch as the legumes can take nitrogen out of the air at no cost, once they are established. The result of this program on the Lassiter farm is that the family is getting along—not getting rich, but making fair progress on land that was worth $25 an acre five years ago.

This program is succeeding largely because it is a program worked out and administered chiefly by the community and the established agricultural agencies. The TVA supplies technical assistance, but the demonstration farm is selected by a land-use association. After the farm is selected, the farmers themselves, through their association, work out the land-use program and supervise it thereafter. The County Agent or Assistant County Agent will work closely with the farmer and the association on the project.

Broad Program

The program involves soil and water control, soil improvement, fertilizer application, and reduction in soil-depleting and erosion-permitting tilled crops and a corresponding increase in grass and legume crops.

The terracing is done by the associations which buy the ma-

chinery, and pay for it from funds accumulated by a per-acre charge made to every farmer benefited. Immense acreages have already been terraced, and the work continues at accelerated speed as the years go on. The methods followed on the demonstration farms are rapidly adopted as standard practice by farmers generally in the area. Agriculture in the Valley is being rehabilitated at a rapid rate. The whole vast enterprise, from the huge flood-controlling and power-producing dams down to the terrace and winter cover crop on the remotest 20-acre field, is integrated into a well planned and carefully blueprinted project of mighty consequences to the South and to the nation itself.

As far as the soil is concerned, phosphorus is the master key to the whole plan of improvement, because there is no substitute for it. Nitrogen can be manufactured, or it can be taken out of the air by legume plants, but you can't take phosphorus out of thin air. It must be taken out of the earth where Nature has deposited it, and then transported to the soil that needs it. And it is the limiting element to increased yields in the bulk of our soils today, in all probability.

Its importance has been demonstrated repeatedly. In experiments at the University of Tennessee, lespedeza hay grown on a phosphate-rich soil has been analyzed and found to contain, per ton of dry matter, 13 pounds of phosphate, 35 pounds of lime, 30.2 pounds of potash, and 43.4 pounds of nitrogen. Lespedeza hay from a phosphate-poor soil contained only 5.4 pounds of phosphate, 26.8 pounds of lime, 22.8 pounds of potash, and 35.6 pounds of nitrogen.

Carrying the experiment still further, red clover hay from phosphate-rich and from phosphate-poor soils were fed to growing calves. The one gained 153 pounds and increased its heart girth by almost five inches in six and one-half months, while the other gained only 104 pounds and increased its heart girth by only 2½ inches. The superior animals and the more rapid gains claimed for the rich phosphate lands have been proved to be realities of great significance to the farm economy of the nation.

And so you conclude your tour of the Valley, impressed as never before with the magic qualities of this essential element of plant food, the all-important phosphorus which is vital alike to crop yield and to animal development. You begin to appreciate what a great national asset is the area that holds the phosphate deposits, as well as the entire Valley.

4-H Better-Seed-Corn Project Becomes a Louisiana Industry

Condensed from Extension Service Review

EVERY year farmers in Louisiana are asking county agents "Where can I get the best seed corn. The usual answer is "Get some of the Rapides Parish 4-H corn."

This State-wide attitude of the Louisiana extension workers is not based on opinion, for the 4-H seed-corn program of Rapides Parish has developed into an industry that brings to the farmers an annual income of more than $50,000.

Under the leadership of Assistant County Agent B. W. Baker, the work has progressed in a systematic way since 1923, when, for the first time, all 21 corn-club boys enrolled that year agreed to plant only purebred seed on their acre projects. Each boy also grew some kind of legume in his corn. All the boys successfully carried out their projects. The "champion" produced 123 bushels on his acre plot, and the work attracted much attention.

Since then, hundred-bushel yields have become common in the 4-H corn clubs of Rapides Parish; and the fact that the club members have greatly improved the quality of their corn has been established by their consistently high winnings at the Louisiana State fairs. A Rapides Parish corn-club member has exhibited the champion 10 ears of corn at 7 out of the last 8 State 4-H shows.

"Before the development of this project in the parish we found it very difficult to procure good seed corn," said Mr. Baker. "Many times we paid high prices for seed corn, only to be disappointed in both the yield and the quality of the corn grown from the seed purchased. As an agent, I desired to see the 4-H corn-club boys of this parish exhibit winning samples of corn at the State fairs; however, it seemed impossible for us to exhibit winners from the seed available. With the help of the extension agronomist, club members purchased the very best seed available of the varieties recommended for their section and set out in a systematic way to improve the quality and increase the yield by careful field selection and hand-picking of all seed stock."

By 1926 a systematic plan for seed-corn production was under way with a small group of 4-H

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members. The next year 70 corn-club members enrolled, and 40 of them reported 2,328 bushels of corn harvested from 45 acres—averaging 51.7 bushels per acre as compared with the average parish production of 20 bushels. The highest 4-H yield was 94 bushels per acre. During the succeeding 2 years the 4-H corn clubs grew in membership, yields increased per acre, and corn champions increased in number. In 1930, 6 members reported yields of more than 100 bushels per acre.

"By the selection of seed ears from the stalks that showed an inherent tendency to produce heavily without any undue advantage, this 13-year program in field selection has given an average increase in yield of 18 bushels per acre over corn grown from unselected seed," says Mr. Baker. In addition to good seed, proper fertilization and shallow cultivation have been contributing factors to the success of the corn program.

Interest in the 4-H corn-club activities spread, as farmers visited the convincing demonstration plots. Soon the parish farmers began buying the 4-H seed corn. By 1931, orders for seed-corn were received from other Louisiana parishes. The following year, the Rapides 4-H Club boys and a few co-operating farmers sold 300 bushels of 4-H seed-corn through the Louisiana Farm Bureau and locally at very satisfactory prices. Since then, the seed-corn sales have rapidly increased each year, until Rapides Parish has become the State's major source of supply of good seed corn. Each season, before the price agreement is reached, samples of all seed-corn to be offered for sale are submitted to the State seed laboratory for official germination tests. Last year the samples ran from 90 to 100 percent strong germination and 100 percent pure.

A State Certified Seed Growers' Association was organized by the Louisiana Growers 4 years ago. Rapides Parish has the majority of the foundation stock certified seed-corn growers of the State. Since 1934, the local seed companies of Alexandria, La., have been handling the certified seed corn; and their business has continued to increase at an enormous rate. More than 40,000 bushels of seed-corn were sold by the Alexandria stores last year, and this year's sales approximate 45,000 bushels.

For the Farmer's Library

These books are recommended as outstanding in their field:

Beef Cattle—By Roscoe R. Snapp, Asso. Prof. Animal Husbandry, Univ. of Illinois. John Wiley & Son, Inc. $4.00.
(See Farmers Digest, November, 1939)

Beekeeping—By Everett Franklin Phillips, Professor of Apiculture, Cornell University. Published by the Macmillan Co. $4.00.
(See Farmers Digest, July, 1940)

Breeding Your Own, or Raising Colts for Pleasure and Profit — By Clarence E. Bosworth. The Derrydale Press ($10.00). A book suitable for the breeders of hunters' and saddle horses.

Conservation in the United States—By Gustafson, Ries, Guise and Hamilton. Comstock Pub. Co. $3.00.
(See Farmers Digest, July, 1940

Dairy Cattle and Milk Production—By Clarence H. Eckles, B.S.A., D.Sc., late Chief, Div. of Dairy Husbandry, Univ. of Minnesota. Macmillan Company. $3.60.
(See Farmers Digest, February, 1940)

Feeds and Feeding—By F. B. Morrison, Prof. of Animal Husbandry and Animal Nutrition, Cornell Univ. Morrison Press. $5.00.
(See Farmers Digest, October, 1939)

Farm Meats—By M. D. Helser, B.S.A., M.S., Prof. Animal Husbandry, Iowa State College. Macmillan Co. $2.90.
(See Farmers Digest, January, 1940)

Farm Records—By John A. Hopkins, Ph.D., Asso. Prof. of Eco., Iowa State Col.; pub. by Collegiate Press. $2.50.
(See Farmers Digest, October, 1940)

Livestock and Poultry Diseases—By W. A. Billings, Asst. Prof. of Vet. Medicine, Univ. of Minnesota. Macmillan Co. $3.50.
(See Farmers Digest, June, 1940)

Poultry Husbandry—By Morley A. Jull, Prof. of Poultry Husbandry. Univ. of Maryland. McGraw, Hill & Co. $4.00.
(See Farmers Digest, July, 1939)

Pork Production—By William W. Smith, Prof. of Animal Husbandry, Purdue Univ. Macmillan Co. $3.75.
(See Farmers Digest, September, 1939)

Sheep Production— By Levi Jackson Horlacher, B.S.A., M.A., Asst. to Dean, Col. Ag. Univ. Ky. McGraw-Hill Co. $4.00.
(See Farmers Digest, September, 1940)

Vegetable Crops—By Homer C. Thompson, Ph.D., Prof. Veg. Crops, Cornell Univ. Pub. McGraw Hill Book Co. $5.00.
(See Farmers Digest, May, 1940)

For the convenience of our readers, books listed may be purchased through this Department. Address C. Leavitt Dyer, Farmers Digest, Ambler, Pa.

Soil Conservation Bulletins

To Hold This Soil

Miscellaneous Publication No. 321, U. S. Department of Agriculture
For sale by the Supt. of Documents, Washington, D. C. Price 45c

Terracing for Soil and Water Conservation

Farmers' Bulletin No. 1789, U. S. Department of Agriculture
For sale by the Supt. of Documents, Washington, D. C. Price 10c

What is Soil Erosion?

Miscellaneous Publication No. 286, U. S. Department of Agriculture
For sale by the Supt. of Documents, Washington, D. C. Price 15c

Strip Cropping for Soil Conservation

Farmers' Bulletin No. 1776, U. S. Department of Agriculture
For sale by the Supt. of Documents, Washington, D. C. Price 5c

The Land in Flood Control

Miscellaneous Publication No. 331, U. S. Department of Agriculture
For sale by the Supt. of Documents, Washington, D. C. Price 10c

Conservation Farming Practices and Flood Control

Miscellaneous Publication No. 253, U. S. Department of Agriculture
For sale by the Supt. of Documents, Washington, D. C. Price 5c

Soil-depleting, Soil-conserving and Soil-building Crops

Leaflet No. 165, Department of Agriculture
For sale by the Supt. of Documents, Washington, D. C. Price 5c

Soil Conservation Districts for Erosion Control

Miscellaneous Publication No. 293, U. S. Department of Agriculture
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STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACTS OF CONGRESS OF AUG. 24, 1912, AND MARCH 3, 1933
of the Farmers Digest, published monthly at Ambler, Penna. for November 1, 1940

State of Pennsylvania | ss
County of Montgomery |

Before me, a Notary Public in and for the State and County aforesaid, personally appeared L. Bush-Brown, who, having been duly sworn according to law, deposes and says that he is the Editor of the Farmers Digest and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, as amended by the Act of March 3, 1933, embodied in section 537, Postal Laws and Regulations, to wit: 1. That the names and addresses of the publisher, editor and associate editors are: Publisher, The School of Horticulture, Ambler, Penna.; Editor, L. Bush-Brown, Ambler, Penna.; Associate Editors, C. L. Dyer, New Hope, Penna.; A. E. Heick, Ambler, Penna. 2. That the owners are L. Bush-Brown, Ambler, Penna.; C. Leavitt Dyer, New Hope, Penna.; A. E. Heick, Ambler, Penna.
3. That the known bondholders, mortgagees and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages or other securities are: none. Signed, L. Bush-Brown, Editor. Sworn to and subscribed before me this 7th day of October, 1940 (Seal). E. Mildred Kimbel, Notary Public. (My commission expires February 7, 1941.)

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